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Twentieth Annual Report

OF THE

PENNSYLVANIA

Department of Agriculture



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PENNSYLVANIA
DEPARTMENT OF AGRICULTURE

OFFICIAL LIST, 1914

N. B. CRITCHFIELD, Secretary.
Stoyestown, Somerset County.

A. L. MARTIN, De'p Sec'y and Director of Farmers' Institutes.
Enon Valley, Lawrence County.

M. D. LICHLITER, Chief Clerk.
Bellevue, Allegheny County.

E. C. FIRST, Clerk, Farmers' Institute Division,
Harrisburg.

BERTHA H. SIEBER, Stenographer,
Harrisburg.

J. FRANK ZORTMAN, Messenger,
Etters, York County.

JAMES FOUST, Dairy and Food Commissioner,
Altoona, Blair County.

MAY V. RHONE, Clerk, Dairy and Food Commissioner,
Center Hall, Centre County.

WILLIAM R. SWARTZ, Messenger, Dairy and Food Commissioner,
Duncannon, Perry County.

H. A. SURFACE, Economic Zoologist,
Mechanicsburg, Cumberland County.

JOHN K. MUSGRAVE, Assistant Economic Zoologist,
Pittsburgh.

V. A. E. DAECKE, Clerk, Economic Zoologist,
Philadelphia.

KATHRYN P. FIRST, Stenographer, Economic Zoologist,
Harrisburg.

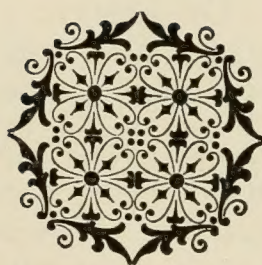
J. C. SIMMONS, Messenger, Economic Zoologist,
New Cumberland, Cumberland County.

C. J. MARSHALL, State Veterinarian,
Philadelphia.

T. E. MUNCE, Deputy State Veterinarian,
Washington, Washington County.

RUSSEL T. WHITSON, Clerk, State Veterinarian,
Lancaster, Lancaster County.

ADELINE V. GREATHEAD, Stenographer, State Veterinarian,
Harrisburg.



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TWENTIETH ANNUAL REPORT

OF THE

SECRETARY OF AGRICULTURE

Hon. John K. Tener, Governor of Pennsylvania:

My Dear Sir: In compliance with the requirements of the Act of Assembly creating the Pennsylvania Department of Agriculture it becomes my duty to submit to you my report for the year just closed.

In conformity with my custom in the past, this report, although outlined at the close of the year 1914, will be found to contain some matter relating to, and completed in the year 1915. For example, the Farmers' Institute work for each year begins in the latter part of one year and closes in the early part of the year following; hence, information given concerning this work necessarily embraces parts of two calendar years. Information also relating to the operations of the State Board of Agriculture can not be given until after the annual meeting of the Board, the proceedings of which have relation particularly to the work of the year immediately preceding the year in which the meeting is held. The same is true of some other agricultural associations, that have no direct official connection with the Department, the record of whose proceedings furnishes much important farm literature that would lose much of its value if it were held over until the close of the year during the early part of which such meetings are held.

AGRICULTURAL CONDITIONS IN PENNSYLVANIA

Ranking second in population, manufacturing, commerce and wealth, Pennsylvania is justly entitled to the high position she holds in the sisterhood of states. That she ranks fifth in the amount and value of her agricultural products, is owing to the fact that a large per cent. of her territory is mountainous, in which sections, much of the surface is so broken and rough as to make cultivation difficult, if not impossible, and the soil is thin and unproductive.

In the southeastern section of the State, however, there are large areas of land unsurpassed in fertility and general conditions favor-

MAY 9 1916

able to cultivation by any portion of the United States. This section embraces the counties of Lancaster, Lebanon, Montgomery, Delaware, Chester and portion of York. Like sections of territory, that are comparatively free from mountains, are found in the southeastern corner of the State and extending along the western border to the northern boundary. In other sections of the State, large valleys occur between hills and mountains, possessing soil conditions as favorable to agriculture as any of the sections of the State already referred to, and at the same time possessing, on account of their location, very superior climatic conditions, so that in the agricultural advantages they possess they are practically unsurpassed. In former reports more complete reference has been made to these favorable agricultural conditions, and this brief reference is repeated here for the benefit of such inquirers as may not have had access to former reports.

Added to the favorable soil and climate conditions referred to, the great mining and manufacturing interests of the State have brought to the door of the Pennsylvania farmer a market unsurpassed for everything produced upon the farm, from the highest grade of animal products to the lowest and most cheaply produced vegetables raised for human consumption.

THE DEPARTMENT OF AGRICULTURE AND THE WORK IT IS DOING

Recognizing the importance of encouraging agriculture in the State, the General Assembly of the Commonwealth passed an Act, in 1876, creating a State Board of Agriculture, which, from its organization, became an active factor in improving agricultural conditions in the State, and was, until 1895, the only active agency through which the State operated to secure this end.

The recognized necessity for providing closer supervision of the agricultural interests of the State and more efficient means of extending agricultural knowledge, led to the passage of the Act of 1895, creating a Department of Agriculture and outlining the work it should perform.

This Act did not do away with the Board, but provided for the co-operation of Department and Board, which, to the mind of the writer, has proved very efficient, producing results that could not, without such co-operation, have been secured without largely increasing the cost.

The work of the Department from the beginning has been two-fold: First, the educational work; and second, what may be termed the administration or police work with which it is charged.

It is the opinion of the writer that in both these lines of activity our State is, in the organization and efficiency of its work, equal to any, and superior to most of the states of the Union.

FARMERS' INSTITUTES

Of the educational work done by the Department, the first to be organized, was that done by the Bureau of Farmers' Institutes. This work was started by the State Board of Agriculture before the Department was created; and has been increasing in importance every year.

The State is now divided into five sections, and instructors sufficient in number and qualified by both training and experience, are sent into each of these sections going from county to county, where the Local Managers, previously appointed, have in advance made arrangements for holding Movable Schools of Agriculture and Farmers' Institutes, delivering lectures and giving object lessons and systematic instruction upon all subjects relating to Successful Farming, Domestic Science and the Improvement of Rural Conditions generally.

Each body of instructors is placed under the leadership of a competent superintendent, and the closest supervision possible to be given by one person is given to the entire work of the State by the Deputy Secretary of Agriculture, who is ex-officio Director of Farmers' Institutes.

During the last institute season, two hundred and twenty-nine Farmers' Institutes and seven Movable Schools of Agriculture were held, which were attended by one hundred eighty-six thousand six hundred and four persons, the great majority of whom were farmers and their families; and during the time of their progress many reports came to the Department of the efficient work that was being done by the lecture force engaged.

The number of persons receiving instruction at these Movable Schools and Farmers' Institutes has been increasing every year since the work began, and I doubt whether any of the work done in our State for the education of farmers in the line of their occupation makes as good return for the amount of money expended as is made by Farmers' Institutes.

A very important addition to the educational work of the Department was made possible by our last General Assembly passing the Act of May 14, 1913, authorizing the appointment, by the Secretary of Agriculture, of ten persons, qualified by actual experience, to give instruction in the science of agriculture and demonstrations of agricultural methods at such times and places as seem advisable.

This work was organized August 1, 1913, to which reference was made in last year's report, and continued until December 1, of same year, when it was discontinued for the reason that field work could not well be kept up after that season of the year, and the persons engaged in the field work were placed upon the Farmers' Institute force. During the year just closed every county in the State was visited by some of the members of this body of instructors, where practical demonstrations of approved farm methods or instruction suited to the wants of the persons asking for the same, were given. The subjects receiving attention by these special instructors and demonstrators embraced Soil Improvement, Dairying and Animal Industry, Poultry Production, Drainage, Water Supply, Vegetable and Fruit Growing, Home Sanitation, Household Economics, etc. Reports coming to the Department from farmers whose places were

visited, testify to their appreciation of this branch of our educational work and the value of the service rendered.

An important part of the educational work of the Department consists of special investigations made and the reports upon the same which from time to time are published by the Department, such for example as soil and climatic conditions in different parts of the State and their adaptability to the production of certain crops, farm buildings, including economy and utility of construction and ventilation, breeding and caring for livestock, and a wide range of other subjects of special importance to farmers.

Within the last two years an exhaustive survey was made, completed in 1914, of the soils found in the different localities of the State, and investigation was made as to the specific crops to which they are best adapted, the report of which, being too large for a single volume, has been divided into parts, first and second. Part First has come from the press and is now being distributed, while Part Second is still in the hands of the State Printer*. This report will be of inestimable value to the agricultural interests of the State.

BUREAU OF ECONOMIC ZOOLOGY

The work of the Bureau of Economic Zoology, to which has been assigned also the special work of the Department in the line of fruit production, is both educational and administrative. It is well organized and all its operations are conducted upon definite and well defined plans, carefully followed out under the direction of the Economic Zoologist of the Department.

Original investigations are made for the discovery of successful means for suppressing diseases and destroying insect pests to which fruit trees and fruit producing shrubs and plants are subject, some of which are now being used not only in our own State, but are being recommended and used by Economic Zoologists and Entomologists in other states and countries.

Demonstration orchards have been established by this Bureau of the Department in every county of the State, making it possible for any citizen of the Commonwealth who is interested in fruit growing to reach a Model Demonstration Orchard in less than a half day's drive from his home.

This special work was, so far as we are able to learn, originated in this State; and while other states have since taken it up, there are at this time as many such Demonstration Orchards in this State alone, as there are in all the other states of the Union combined.

In order to be able to do this demonstration work in which improved methods of fertilizing, cultivating, pruning, spraying, etc., are shown, it was necessary, in the beginning to take under special training a corps of intelligent men, who had the advantage of some experience in fruit growing, until they became fully qualified for the work they had to do. This force has been kept up by adding to it new men from time to time to take the places of such as drop out.

During the last twelve years, all the orchards of the State, old and young, have been inspected, the work being done with a view to reach all classes of owners, from the wealthy farmer with ample farm orchard and the extensive fruit grower with his commercial orchard,

*Part Two, since the above was written, has been published.

to the village or rural resident possessing little means and but a few trees. No section of the State has been neglected, and help was given to many people who were not conscious of the fact that they needed help.

This work was followed up during the year, and reports of conditions found by Orchard Inspectors were regularly made to the office of the Economic Zoologist at the State Capitol, upon the receipt of which information concerning proper treatment for such conditions was forwarded to the orchard owners or persons in charge, care being observed to send no direction or instruction that is not known to be accurate and correct.

In order to keep the Orchard Inspectors profitably employed during periods of severe weather, when out-door work is impossible, a system of lectures suited to public schools has been established, for which special charts and specimens have been prepared and placed in the hands of the demonstrators, and through the cooperation of teachers, patrons and in a number of instances, County Superintendents, this work has achieved such success and proved so valuable as to make it, for some time at least, indispensable, and hence it was continued during the part of the year that rural schools were open.

Teachers making collections of specimens for their school work in all parts of the State were assisted during the year by the Bureau of Economic Zoology, and specimens sent by them to the Department were named and classified, while such other specimens as this Bureau could supply were sent them to assist them in their work.

All these lines of work were carried forward during the year in a manner quite satisfactory to the head of the Department.

The administrative or police work of the Department consists of the supervision it has of the work of carrying out the provisions of certain Acts of Assembly intended for the protection of farmers, and other citizens of the Commonwealth, from injury arising from neglect of land owners and others to observe certain duties required by law to prevent the spread of insect pests, etc., and from possible fraud on the part of manufacturers of, and dealers in, Commercial Fertilizers, Commercial Feeding Stuffs, Linseed Oil and Farm Seeds.

The first named of these laws relates to the inspection of nursery stock on sale in Pennsylvania, including the inspection of all nurseries within the State, and such nursery stock and other plants as are imported from foreign countries and seeing that our State laws relating thereto are complied with. This work belongs to the Bureau of Economic Zoology and has received such attention during the year as to practically preclude the possibility of the introduction into our State of any of the destructive insects that are prevalent in other countries.

BUREAU OF FERTILIZER CONTROL

The Bureau of Fertilizer Control has charge of the administration of the laws regulating the sale of commercial fertilizers.

During the spring and fall seasons of the year just closed, three thousand two hundred and eighty-two samples of commercial fertilizers were collected by agents employed in this Bureau, of which only one thousand one hundred ninety-four were subjected to chemi-

cal analysis and microscopic examination to determine whether or not the manufacturers of the same were complying with the requirements of the law. The remainder of the three thousand two hundred eighty-two samples were not analyzed, for the reason that the agents taking samples in different sections of the State could not be advised as to what fertilizers were being sampled by other agents, and it often so happened that from two to ten samples were taken of the same goods and in no instance were there more than three samples composited or made into a single sample for analysis.

Of the samples analyzed, but two fell far enough below the manufacturers' guarantees to indicate criminal carelessness or fraudulent intent, and in these cases prosecutions have been ordered and followed to final determination. The only cases for the violation of the Fertilizer Law that were prosecuted and terminated during the year were for failure to register the goods as required by law.

I desire to call attention to the fact that in the analyses made of fertilizers during the year just closed, the determinations made for nitrogen content included "water soluble," "available" and "insoluble," which is a departure from former practice.

More complete information in relation to this matter is given in the Chemist's Reports found in Fertilizer Bulletins Nos. 255 and 259. See also full Report of Fertilizer Control work, pages

BUREAU OF CHEMISTRY

The laws regulating Commercial Feeding Stuffs, Linseed Oil and Farm Seeds are administered by the Bureau of Chemistry, and close supervision was given during the year to give to all concerned the protection these laws are intended to give farmers and all others having occasion to purchase these commodities. A canvass of the entire State resulted in securing one thousand three hundred samples of Feeding Stuffs, two hundred and two samples of Farm Seeds and two hundred and fifty samples of Linseed Oil, all of which were subject to chemical analysis and microscopic examination.

Of the Feeding Stuffs analyzed, thirteen samples were found to be not in accordance with the requirements of the law, in which cases prosecutions were brought, twelve of which were followed to termination and \$600.00 in fines paid into the State Treasury. The other case being against one of the twelve defendants that paid fines, the Department consented to withdraw the case upon payment of costs by defendant.

Eight samples of Linseed Oil were found to be adulterated, the adulterating usually consisting of the addition of mineral oils. These cases were prosecuted and fines amounting to four hundred dollars were collected and paid into the State Treasury.

The samples of Farm Seeds were inspected by the Seed Specialist of the Bureau of Chemistry and all were found to be of high grade, very few falling in any degree below the standard fixed by law.

Inasmuch as this was the first year that the law has been in effect and the character of all the samples were such as not to indicate fraudulent intent on the part of the vendors, they were notified of the conditions found and their attention was called to the requirements of the law but no prosecutions were ordered.

DAIRY AND FOOD BUREAU

The work of the Dairy and Food Bureau throughout the year was characterized by the same energetic activity that has attended its operations in the past. Four thousand eight hundred and eleven food samples were secured by its agents, which, with a number of samples sent to the Bureau under such protective regulations as warrant their correct identification, were examined during the year by professional food experts, and one thousand and ten cases of violations of the various Acts of Assembly that are enforced by this Bureau were found and dealt with as these several Acts provide.

This statement not only shows the immense amount of work devolving upon this Bureau, but also the importance of this work to the health of our people.

The financial statement made in the Dairy and Food report shows that the receipts of the Bureau for the year are in excess of the expenditures to the amount of one hundred fifty-two thousand, six hundred thirty-nine dollars and thirty-seven cents, which is quite satisfactory to the head of the Department of Agriculture and should be very gratifying to the Dairy and Food Commissioner.

The report as it will be found in full in the following pages is worthy of careful study.

STATE VETERINARY SERVICE

By the provisions of the Act of Assembly creating the Department of Agriculture, the State Veterinarian is an officer of this Department, and hence it is proper that an official report of the veterinary work done by the State shall appear in the Annual Department Report, notwithstanding the fact that later legislation places the veterinary service almost entirely under the direction and control of a State Livestock Sanitary Board. The State Veterinarian, Dr. C. J. Marshall, therefore, sent the head of the Department a comprehensive report which will be found in the following pages. This report is full of valuable information, especially important to owners and breeders of livestock, and is worthy of careful study.

BUREAU OF STATISTICS

The Bureau of Statistics, though in existence for but little more than a year, has proved its importance and value by the good work already accomplished.

The very satisfactory report of the Statistician, found in the following pages, relieves the head of the Department from the necessity of saying anything in relation to crop production and other local farm conditions that have been made matters of consideration in former reports. A careful study of the report is recommended.

Full reports of the work of each Bureau of the Department will be found in the following pages, to which all persons interested are directed.

HELPFUL MEASURES NEEDED FOR FUTURE SUCCESS

These may be considered under two heads: First, such as are dependent upon legislation, and prominent among these I would name the following:

(a) A good State Fair under State control, if possible, but if not possible, let it be under corporate control, the chief thing being to have it.

(b) Legislative provision requiring certain valuable agricultural statistics to be taken by township assessors, to be tabulated by Commissioners' clerks and sent, at the proper season, by the County Commissioners to the Secretary of Agriculture.

(c) Better public roads over which farmers may be able, at less cost, to get their products to railroads and local markets.

(d) Stringent laws for protection of sheep, poultry and other farm animals from injury from dogs.

(e) Rural high schools in every school district or township of the State, in which the elementary principles of the science of agriculture are taught.

Second: Measures needed for improvement dependent upon farmers themselves. These are practically innumerable, but prominent among them I shall mention:

(a) More intensive farming. Better cultivation, including soil preparation, seed-breeding and selection; also including harvesting and preparation for market. One of the greatest mistakes made by farmers of the present period is the attempt to do more than they are able, with their limited help, to do well.

(b) Those engaged in stock breeding should discard mongrels, and "stock up" with pure-bred animals, not all at once of course, but by degrees as they are able. The cost of raising a pure-bred animal is less than that of raising a mongrel, and its value to the farmer in many instances is more than double that of the latter.

(c) More attention to construction of farm buildings so as to provide for the comfort of inmates and minimize the cost of keeping everything in proper order.

(d) Careful study of crop rotation, selecting only such as are best suited to most available markets and soil and climatic conditions.

(e) Some arrangement for giving to farmers' boys and girls a personal and money paying interest in what is produced, so as to increase their interest in the farm and its operations, which is, in my judgment, the most available means of keeping them on the farm. Johnnie's calf and dad's steer when the buyer comes, will dishearten the best boy on earth.

Such suggestions for improvement are not original with any one man, but all, and many more that might be made, are apparent to every one having experience with farm conditions and practical knowledge of farm life.

CLOSING WORDS

The 25th day of February, next, will complete a period of twelve years' service that I have had with this Department. These have been years not only of earnest labor for the improvement of agricultural conditions in our beloved State, but also enjoyment.

I have enjoyed during these years the satisfaction that comes from the consciousness of being engaged in a work, intended at least, to be helpful to others and the pleasure of being associated with a body of co-laborers composed of honorable and highminded men and women, and inasmuch as I expect in a short time to retire from the position I occupy, I wish in this public way to acknowledge my obligation to all my assistants who have so ably and loyally helped me in my official work and to the several Chief Executives that have done me the honor of calling me to and continuing me in this work, as well as to the many of my fellow-farmers whose generous confidence and support have been more helpful to me than I am able to express.

I can not think that my successive appointments to this position were prompted by any thought on the part of the respective Governors by whom such appointments were made, that I possessed any special qualification above others for the place, but my thought is that these continued appointments were the result of the generous support given me by my fellow-farmers, resident in this my native State. Nor can I think that support was given in the belief that I was better qualified than many others who might have been called to the place, but rather on account of the belief that being farm-born and farm-bred I should be in full sympathy with my work and the two hundred and forty thousand farmers of the State who were and are more interested in the work of the Department than other citizens of the Commonwealth.

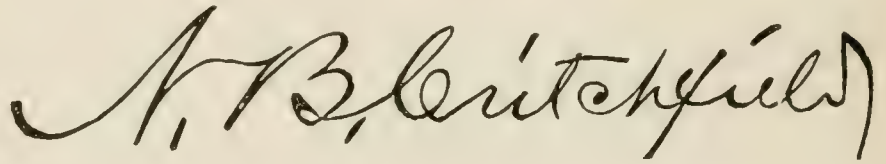
As to how well I may have succeeded in discharging my official duties while in this position I am unable to judge, and if I were able to judge it would not be fitting for me to say any thing, but I think that it is no more than proper that I should say I have endeavored to give the State and her people, all of whom I love, the best service of which I am capable.

Having attained an age at which I think it my duty to myself and family to seek the relaxation that can only be secured in some less responsible work, I have declined to comply with the wishes expressed by many of my farmer friends, both by letter and personal interview, who have been insistent that I should be a candidate for another reappointment. I have, however, not lost my interest in the work of this Department nor in the well-being of those who have been associated with me in it, to whom, as already stated, I feel greatly indebted for the loyal support and able assistance they have at all times given me.

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I wish also to express my appreciation of the kind treatment and generous assistance I have at all times received from the public press, and particularly the agricultural press of the State.

Very truly yours,

A handwritten signature in cursive script, reading "A. B. Britchfield". The signature is written in dark ink and is positioned below the closing "Very truly yours,".

Secretary of Agriculture.

TWENTIETH ANNUAL REPORT OF THE BUREAU OF FARMERS' INSTITUTES FOR SEASON OF 1913-1914

To the Hon. N. B. Critchfield, *Secretary of Agriculture*:

Sir:—I have the honor to present herewith the Twentieth Annual Report of the Bureau of Farmers' Institutes.

INSTITUTES AND MOVABLE SCHOOLS

The institutes for year ending June 1, 1914, have, without doubt, developed a more wide spread interest in agricultural development than any other year from their organization. The adverse weather conditions met with the past winter season, together with the visitation of contagious diseases, such as measles, scarlet fever, diphtheria, etc., prevented holding meetings in many parts of the State. One of the encouraging things noticed, as a result of our teachings, is the adoption of well tried and approved methods by our farmers in the various branches of farm pursuits within the Commonwealth. The progressive farmer has brought into practice a more profitable system of rotation of crops, embracing, for the central and southern portion of the State, corn, oats and wheat, with one and not more than two years using same field for hay crop, thus procuring a strong, well established sod for plowing-in. By such practice the field is supplied with humic matter, adding thereto to the power of holding moisture and increasing the productive powers of the land by so particular method of rotation.

In the greater portion of northern Pennsylvania the rotation is shortened by eliminating the wheat crop and seeding the fields to the clovers and grasses, following the oats crop, a method that seems to be practical for that portion of the State.

Through the efforts of Farmers' Institutes, the dairymen have practically eliminated from their herds the unprofitable cows. This result is accomplished by keeping a daily record of each individual cow in the herd, together with careful feeding and management. Through such method the more skillful dairymen have brought up the yearly production of butter-fat to above 300 pounds per cow. Our horticultural and orchard instructors have, by demonstration and oral instruction, awakened such an interest in this highly attractive branch as to place Pennsylvania as one of the leading states in apple production. The successful apple grower practices an extensive system of fertilizing, cultivating, pruning and spraying his orchard; he also has a constant watch for such insect enemies as are destructive to the trees if allowed to continue their activities unchecked in his orchard for a considerable length of time, so that today the Pennsylvania apple is finding its way into not only the markets of our own State but of other states, because of its formation, high flavor and free from such diseases as are manifested in fruit from neglected orchards.

No industry within the State has made more rapid strides in its development than that of poultry. To such extent has this industry grown that we have today nearly 200 commercial poultry farms in actual operation, most of which are developing egg production. At these plants is placed in practice a most approved method of housing, feeding and general care and management, resulting in the production of eggs to an average value in many instances of over \$2.00 per hen. The farm poultry of the State has, possibly, in its care and management, made a still greater improvement, such as clean, well ventilated houses, the introduction of thorough-bred stock of all varieties. The rural delivery service is affording a splendid opportunity for the farmer, especially the poultrymen, to reach the consumer in towns and cities by sending packages of fresh eggs daily, and farmers who adjust their products and market conditions to this method are in the line of procuring greater profits for the products.

FARM ADVISERS

Possibly no legislation enacted within the last decade has provided so efficient an agency in aiding the farmer in the matter of adopting scientific and approved methods than that brought to him by the Farm Advisers, who take up Crop Rotation, Soil Building, Plant Growth, Dairy Husbandry in all its branches, together with Poultry Management, Farm Drainage, etc., since there is no greater need for development on thousands of farms within the State. The Market Gardener and Fruit Grower has been fortified in his work; also the co-operation in Buying and Selling Farm Products has directed thousands of farmers as to the best location to market their products. Home Sanitation is not the least important branch of this work as it relates to the health, comfort and happiness of the farm homes in Pennsylvania.

A slight idea of how this work is appreciated by the farmers of the State and the good it has accomplished, we beg to quote a few statistics of its existence ending November 30, 1914, the date of which the advisers enter into Farmers' Institute work until the middle of March. During the first 11 months there were visited 7,665 farms in Pennsylvania, giving advice and counsel to there farmers on the industrial problems that confronted them.

Mr. E. B. Dorsett, Adviser on Co-operation, visited 45 counties in the State, many of them several times, spending much of his time in perfecting Farm Organizations, such as the Grange, Farmers' Clubs, Unions and other farm organizations. All these organizations gave valuable assistance, and in return received many benefits. 161 public and 50 private meetings were addressed by him during the season, the average attendance at these meetings was 150, making a total of 30,000 farmers addressed. Through the medium of his work many sales were made of agricultural machinery and implements bought and sold. He supplied, approximately, 3,000 tons of fertilizer and fertilizer chemicals at an average saving to the farmer of \$5.00 per ton, 40 tons of binder twine at a saving of 2½ cents per pound, 2,000 tons of feed at a saving of \$4.00 per ton. These are only a few of the many transactions in which the farmers were able to save money. Fully 500,000 farmers were benefited directly or indirectly by these transactions. In addition to buying and selling he gave as-

sistance in marketing products—about 100 carload of potatoes were sold, which yielded the farmer from 10 to 15 cents per bushel more than he could have got at his local market; 100 cars of hay and straw during the year bringing the farmer a net return of from \$2.00 to \$4.00 per ton more than he could have realized by selling to the local dealer as well as many other crops which space will not allow us to itemize.

Chas. G. McLain, Farm Adviser on Farm Drainage and Water Supply, has visited almost every county in the State laying out systems for over 269 farms with the following results: In some cases the drainage was very great and in all cases where his recommendations have been carried out the benefits has been of such character that the production has been increased considerably, proving that tile drainage, when properly put in, is a paying investment. The different kinds of soil in Pennsylvania requires different methods of drainage. In many cases a thorough drainage is necessary and in other cases a random system is enough to accomplish all that is necessary. He has laid out quite a number of systems for drainage of orchards, and has been called into consultation as to planting an orchard in such a way as to fit them for future drainage. Also advising farmers as to gravity systems, some at a small cost.

Sheldon W. Funk, Farm Adviser on Fruits and Vegetables, has worked in 46 counties of the State, making from one to 27 different visits in a county, having made 550 visits to individual farms, and in each case gave the farmer some practical advice that he was desirous of gaining. He attended 50 agricultural meetings and demonstrations and addressed 22,000 people at these meetings; also six county fairs judging fruit and vegetables. At these meetings he would go over the entire orchard, demonstrating the proper methods of preparing the soil, of setting and pruning the trees or of spraying and thinning the fruit. In other cases he would go over a well cared for orchard and then through a neglected orchard calling attention to the beneficial results of fertilizers, of tillage or of mulch, or again showing the results of injury from insects and diseases. The brevity of the report prevents us from entering more into detail upon his line of work, which undoubtedly is an asset to the farmers of the State.

W. Theo. Wittman and Frank Kline, Farm Advisers on Poultry, have between them visited every county in the State, having more application than they could fill, giving attention to 1,500 calls. The personal calls have covered every phase of poultry keeping, from showing a man how to set a hen or run an incubator or select his stock to equip a large commercial plant and putting same on a paying basis; also lecturing before poultry organizations and other agricultural meetings, with an attendance at these meetings of over 50,000 people, spending three weeks on demonstration car on L. V. R. T., making 20 stops and covering the entire system in Pennsylvania, which reached many thousands of interested persons; acting as judge on poultry at 14 different fairs within the State and furnishing plans and selecting sites for poultry plants, amongst the largest public institutions are as follows: Masonic Home, Elizabethtown, Pa.; Odd Fellows' Orphanage, Sunbury, Pa.; Cheyney Training School of Teachers, Cheyney, Pa.

Prof. Franklin Menges and R. P. Kester, Farm Advisers on Soils,

visited quite a number of farms as well as public meetings, judged at fairs, etc. The benefits of which can not be over estimated.

Dr. M. E. Conard and L. W. Lighty, Farm Advisers on Dairying and Animal Husbandry, visited every county in the State, reaching over 1,200 farmers, about one-half the farmers holding family meetings for their neighbors to procure information during the evenings, taking up Cow Testing Associations, planning Dairy Barns, together with siloes, etc. Also serving as expert judges on livestock at many of the County Fairs and Agricultural Exhibitions of the State.

Mrs. Jean Kane Foulke, Farm Adviser on Home Sanitation and Household Economics, has been earnestly working among the farmer wives, and has reached almost every part of the State with her demonstrations and lectures, having spent three weeks on Demonstration car on Lehigh Valley R. R., in Pennsylvania equipped for demonstrating Model Beds, Model Door Yards, Model Bedrooms, Model Septic Tank for sewerage for Rural Homes, Model Garments for women and children, washing machine and other household equipment that will help the farmer wife; also her work being in great demand by the home clubs, civic clubs, private homes and schools.

When we realize that we have received over 1,500 commendable letters thanking us for assistance rendered in supplying Advisers, which have saved the farmers of the State thousands of dollars, you can readily appreciate that this development of work certainly deserves the respect of the farmers of the State.

ATTENDANCE AT PENNSYLVANIA FARMERS' INSTITUTES 1913-1914

The following is a complete list, by counties, of dates and places where institutes, movable schools and special institutes were held throughout the State for the institute year ending June 1, 1914:

PENNSYLVANIA FARMERS' INSTITUTES--SEASON OF 1913-1914.

County	Place	Date	Days of institute.	Number of sessions	Attendance by Sessions.			Speakers Present		Attendance		
								State	Local	Average	Total	By counties
Adams,	York Springs,	Feb. 13-14,	2	5	75, 295,	27, 170,	375	3	1	188	942	
	Arendtsville,	Feb. 16-17,	2	5	25, 155,	22, 45,	200	3		89	447	
	Fairfield,	Feb. 18-19,	2	5	85, 225,	48, 55,	225	3		127	638	2,027
Allegheny,	Millerstown,	Jan. 19-20,	2	5	93, 240,	45, 135,	275	3	1	150	750	
	East Union Church,	Jan. 21-22,	2	5	52, 120,	38, 186,	240	3	1	127	635	
	Carnot,	Jan. 23-24,	2	4	85,	315,	230	3	1	177	885	2,270
Armstrong,	Dayton,	March 4-5,	2	4	96, 200,	85, 175,	280	4		167	836	
	Elderton,	March 6-7,	2	4	85, 296,	95, 175,	420	4		206	1,031	
	Spring Church,	March 9-10,	2	4	72, 225,	88, 294,	400	4	3	214	1,010	2,937
Beaver,	Mt. Pleasant Church,	Dec. 17-18,	2	5	18, 95,	56, 110,	165	4		83	414	
	Ohioville,	Dec. 19-20,	2	5	28, 62,	30, 65,	177	3		73	365	
	New Galilee,	Dec. 22-23,	2	5	42, 125,	75, 65,	195	3		95	482	
Bedford,	Pleasant Valley,	Dec. 12-13,	2	5	41, 46,	140, 58,	180	3		92	441	
	New Paris,	Dec. 15-16,	2	5	23, 46,	90, 82,	153	3		78	390	
	Osterburg,	Dec. 17-18,	2	6	10, 48,	30, 80,	170	3		93	468	1,299
Berks,	Womelsdorf,	Jan. 14-15,	2	5	35, 24,	40, 185,	210	3		90	454	
	Centerport,	Jan. 16-17,	2	5	100, 110,	250, 275,	600	3	1	267	1,335	
	Geigertown,	Jan. 19-20,	2	5	55, 75,	150, 275,	300	4		171	855	
	Jacksonwald,	Jan. 21-22,	2	5	100, 125,	350, 250,	450	5	1	255	1,275	3,954
	Geesytown,	Jan. 14-15,	2	5	42, 32,	74, 254,	250	3		130	652	
Blair,	East Freedom,	Jan. 16-17,	2	5	54, 80,	108, 150,	210	3	2	120	602	
(Special),	Holidaysburg,	March 12,	1	1	100, 200,	50,	80	1		80	80	1,334
Bradford,	Athens,	Nov. 25-26,	2	1	157, 300,	175,	150	4		115	576	
	Rome,	Nov. 28-29,	2	1	250, 300,	250,	300	4		236	1,182	
	Canton,	Dec. 1-2,	2	1	200, 300,	300,	300	4		270	1,350	
(Special),	Troy,	Dec. 3-4,	2	1	150, 200,	130,	280	4		230	1,450	
(Special),	Towanda,	March 18-19,	2	1	30, 190,	55, 150,	225	2	2	130	650	
(Special),	Leraysville,	March 18-19,	2	1	40, 100,	80,	100	2	2	102	410	6,613
(Special),	North Orwell,	March 20-21,	2	1	50, 100,	60,	220	2	3	107	430	
(Special),	North Ghent,	March 23-24,	2	1	150, 200,	350,	500	5	1	107	480	
Bucks,	Doylestown,	March 23-24,	2	8	350,	250,	125, 250,	3		75	375	
	Springtown,	Feb. 25-26,	2	3	150, 250,	200,	275,	3		230	1,150	3,925
	Sellersville,	Feb. 27-28,	2	3				3	1			

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1913-1914—Continued.

County	Place	Date	Days of Institute.	Number of sessions	Attendance by Sessions.		Speakers Present		Attendance		
							State	Local	Average	Total	By counties
Butler,	Slippery Rock,	Feb. 25-26,	2	5	54, 275, 28, 167, 346	4	4	2	173	864	
	Prospect,	Feb. 27-28,	2	5	72, 390, 68, 125, 225	4	4	2	176	880	
	W. Jefferson,	March 2-3,	2	5	36, 157, 39, 68, 130	4	4	2	85	425	
(School),	Butler,	Jan. 5-8,	4	11	125, 135, 125, 75, 100, 150, 75, 100, 100, 200, 245,	4	4	.....	130	1,430	
(Special),	Jacksville,	April 1-2,	2	5	100, 125, 75, 150, 200	2	2	3	130	650	4,249
Cambria,	Patton,	Feb. 2-3,	2	5	92, 110, 211, 250, 160	3	3	1	162	811	
	Ebensburg,	Feb. 4-5,	2	6	16, 56, 40, 74, 138, 140	3	3	1	96	484	
(School),	Geistown,	Jan. 7-10,	4	12	75, 168, 125, 185, 175, 325, 375, 678, 115, 71, 400, 125, 400, 300	4	4	1	249	2,984	4,279
					27, 57, 47, 65, 136, 30, 137, 75, 195	2	2	8	71	499	499
Cameron,	Emporium,	Jan. 21-23,	3	7		4	4	.....	54	270	
Carbon,	Weatherly,	Jan. 12,	1	2	130, 210	4	4	.....	170	340	
	Big Creek,	Jan. 13,	1	2	66, 70, 200, 150, 290	4	4	.....	173	866	1,476
	New Mahoning,	Jan. 14-15,	2	5		3	3	.....	130	520	
Center,	Pinegrove Mills,	Dec. 29-30,	2	6	56, 72, 124, 84, 290, 278	3	3	.....	150	904	
	Rebersburg,	Dec. 31-Jan. 1,	2	5		3	3	.....	117	584	2,010
	Jacksonville,	Jan. 2-3,	2	5	58, 82, 142, 94, 208	4	4	4	124	620	
Chester,	Oxford,	Jan. 5-6,	2	4	100, 125, 220, 500, 300	4	4	.....	194	775	
	West Grove,	Jan. 7-8,	2	5	35, 25, 75, 200, 275	3	3	.....	147	735	
	Byers,	Jan. 9-10,	2	5	100, 85, 150, 125, 275	3	3	.....	175	875	3,005
	Cedarville,	Jan. 12-13,	2	5	75, 75, 210, 175, 340	3	3	2	249	1,245	
Clarion,	New Bethlehem,	Feb. 9-10,	2	5	100, 125, 220, 500, 300	3	3	1	320	1,602	
	Sligo,	Feb. 11-12,	2	5	140, 500, 62, 300, 600	3	3	.....	111	555	
	Foxburg,	Feb. 13-14,	2	5	40, 200, 35, 80, 200	3	3	2	131	657	3,907
	Miola,	Feb. 16-17,	2	5	45, 200, 82, 130, 200	3	3	.....	850	850	
(Special),	Venus,	Aug. 28,	1	1	64, 56, 200, 100, 250	3	3	.....	94	470	
Clearfield,	Kermoor,	Jan. 5-6,	2	5	48, 70, 130, 120, 250	3	3	.....	121	608	
	Goshen,	Jan. 7-8,	2	5		3	3	.....	100	403	1,481
	Karthaush,	Jan. 9-10,	2	5	30, 35, 60, 250, 300	3	3	1	135	675	
Clinton,	Wooldrich,	Dec. 29-30,	2	5	100, 150, 250, 200, 275	3	3	2	195	975	
	Loganton,	Dec. 31-Jan. 1,	2	5	50, 40, 150, 20, 125	3	3	2	77	385	2,035
	Beech Creek,	Jan. 2-3,	2	5		3	3	2			

Crawford.	.....	Feb. 2-3.	.....	2	6	92, 195, 95, 195, 205	.....	176	782
Blooming Valley.	.....	Feb. 4-5.	.....	2	5	105, 135, 56, 110, 250	.....	131	656
Conneaut Lake.	.....	Feb. 6-7.	.....	2	5	106, 165, 110, 215, 285	.....	176	881
Atlantic.	.....	Feb. 9-10.	.....	2	5	92, 132, 58, 145, 214	.....	162	708
Bloomsburg.	.....	Jan. 12-16.	.....	4	9	38, 50, 60, 60, 100	.....	.....	.....
	.....		.....	.....	.....	46, 100, 125, 100	.....	.....	684
Newburg.	.....	Jan. 7.	.....	1	3	70, 35, 125, 162, 17	.....	76	340
Oakville.	.....	Jan. 8-9.	.....	2	5	30, 37, 155, 135, 160	.....	82	409
Hogestown.	.....	Jan. 10.	.....	1	3	35, 200, 35, 212, 240	.....	150	450
New Cumberland.	.....	Jan. 12-13.	.....	2	5	.....	.....	103	617
Centerville.	.....	Dec. 3-6.	.....	4	10	.....	.....	122	1,925
Middletown.	.....	Nov. 28-29.	.....	2	5	20, 19, 67, 57, 217	.....	86	430
Gatz.	.....	Dec. 1-2.	.....	2	5	150, 400, 60, 65, 425	.....	218	1,090
Lingiestown.	.....	Dec. 3-4.	.....	2	5	112, 113, 260, 140, 275	.....	180	900
Media.	.....	March 2-3.	.....	2	5	45, 135, 137, 9, 115	.....	89	446
Concordville.	.....	March 4-5.	.....	2	5	40, 140, 200, 110, 205	.....	139	695
St. Marys.	.....	Jan. 5-6.	.....	2	5	40, 50, 180, 150, 100	.....	104	520
Kersey.	.....	Jan. 7-8.	.....	2	5	20, 25, 200, 130, 225	.....	120	600
Wates Church.	.....	Feb. 2-3.	.....	2	5	125, 160, 150, 200, 250	.....	177	885
Millville.	.....	Feb. 4-5.	.....	2	5	30, 100, 40, 160, 175	.....	101	505
Lundys Lane.	.....	Feb. 6-7.	.....	2	5	130, 100, 340, 160, 175	.....	188	940
Dunbar.	.....	Dec. 10-11.	.....	2	5	36, 80, 50, 84, 166	.....	83	416
Smock.	.....	Dec. 12-13.	.....	2	5	35, 88, 60, 120, 185	.....	97	488
Perryopolis.	.....	Dec. 15-16.	.....	2	5	54, 145, 63, 200, 215	.....	136	679
Marionville.	.....	Feb. 18-19.	.....	2	5	35, 200, 125, 170, 225	.....	131	655
Tionesta.	.....	Feb. 20-21.	.....	2	5	80, 200, 80, 250, 300	.....	182	910
Scotland.	.....	Feb. 23-24.	.....	2	5	70, 60, 250, 225, 400	.....	201	1,005
Waynesboro.	.....	Feb. 25-26.	.....	2	5	15, 140, 40, 220, 65, 360	.....	58	298
Marion.	.....	Feb. 27-28.	.....	2	5	42, 92, 176, 135, 263, 240	.....	376	1,880
Dry Run.	.....	Nov. 28-29.	.....	2	5	.....	.....	158	948
Hustontown.	.....	Dec. 1-2.	.....	2	5	.....	.....	98	489
Enid.	.....	Dec. 5-9.	.....	4	11	42, 92, 176, 135, 263, 240, 31, 52, 46, 176, 184	.....	130	1,437
Needmore.	.....	Nov. 28-29.	.....	2	5	.....	.....	178	890
Pine Bank.	.....	Dec. 1-2.	.....	2	5	60, 125, 140, 225, 280	.....	90	451
Sycamore.	.....	Dec. 3-4.	.....	2	5	21, 35, 35, 150, 210	.....	120	603
Orbisonia.	.....	Dec. 6-6.	.....	2	5	36, 13, 230, 42, 262	.....	179	899
McAleys Fort.	.....	Dec. 8-9.	.....	2	5	46, 72, 118, 150, 194	.....	133	666
Alexandria.	.....	Dec. 10-11.	.....	2	5	24, 50, 44, 56, 220	.....	79	394
Marklesburg.	.....	Dec. 29-30.	.....	2	5	87, 275, 105, 250, 325	.....	207	1,037
Smicksburg.	.....	Dec. 31-Jan. 1.	.....	2	5	660, 275, 515, 160, 825	.....	440	2,631
Marion Center.	.....	Jan. 2-3.	.....	2	5	125, 330, 180, 320, 500	.....	290	1,450
Willit.	.....	Jan. 5-6.	.....	2	5	125, 440, 124, 425, 500	.....	325	1,615
Brush Valley.	.....	Jan. 7-8.	.....	2	5	78, 385, 215, 275, 340	.....	247	1,233
Lewisville.	.....	Jan. 9-10.	.....	2	5	200, 250, 400, 300	.....	287	1,150
Kingold.	.....	Jan. 12-13.	.....	2	5	75, 150, 200	.....	142	425
Baxter.	.....	March 4-5.	.....	2	5	92, 67, 210, 185, 266	.....	164	821
McAllisterville.	.....	March 6-7.	.....	2	5	59, 24, 163, 168, 200	.....	113	564
Port Royal.	.....	Dec. 27.	.....	2	5	35, 30, 120, 220	.....	59	177
Tompkinsville.	.....	Dec. 29-30.	.....	2	5	.....	.....	107	535
Madisonville.	.....	Dec. 31-Jan. 1.	.....	2	5	28, 20, 120, 210, 280	.....	131	658
Daleville.	.....	Jan. 2.	.....	2	5	.....	.....	173	520
Bald Mount.	.....	Jan. 3.	.....	2	5	40, 65, 160	.....	88	265
Clarks Summit.	.....	.....	.....	1	3	.....	.....	.....	.....

PENNSYLVANIA FARMERS' INSTITUTES—SEASON OF 1913-1914—Continued.

County	Place	Date	Days of Institute.	Number of sessions	Attendance by Sessions.		Speakers Present	Attendance	
					State	Local		Average	Total
Lancaster,	Maytown,	Dec. 5-6,	6	5	100, 70, 300, 200, 375	4	1	209	1,045
	Mechanicsville,	Dec. 8-9,	5	5	40, 35, 75, 100, 210	5	.....	93	465
	Litz,	Dec. 10-11,	6	5	25, 95, 107, 77, 75, 175	5	.....	92	554
	Ephrata,	Dec. 12-13,	5	5	60, 35, 400, 125, 400	5	1	214	1,020
	Lampeter,	Dec. 15-16,	5	4	70, 70, 200, 200, 225	4	.....	153	765
Lawrence,	Paradise,	Dec. 17-18,	2	5	60, 30, 275, 75, 400	4	.....	168	840
	Millersville,	Dec. 19,	3	5	35, 75, 125	5	1	78	235
	Blue Ball,	Dec. 20,	3	4	60, 135, 150	4	.....	115	345
	Bethel Church,	Dec. 18-19,	2	3	60, 80, 36, 69, 210	3	.....	85	423
	Herman Church,	Feb. 20-21,	2	5	118, 240, 75, 200, 340	4	1	206	1,033
(School),	Plainsgrove,	Feb. 23-24,	2	5	31, 110, 85, 225, 285	4	1	147	736
	Westfield,	Dec. 31-Jan. 3,	4	8	38, 200, 150, 225, 110, 32, 250, 57	4	.....	205	1,642
	Annville,	Jan. 2-3,	2	5	43, 27, 143, 150, 126	3	.....	98	489
	Schaefferstown,	Jan. 5-6,	2	3	75, 53, 280, 288, 315	3	1	202	1,011
	Jonestown,	Dec. 1-4,	4	9	28, 24, 100, 150, 285, 250, 40, 20, 385,	4	1	109	982
Lehigh,	Macungie,	Feb. 9-10,	2	5	75, 70, 300, 220, 330	4	1	199	995
	Laury's,	Feb. 11-12,	2	5	55, 110, 210, 40, 220	4	.....	137	685
	New Tripoli,	Feb. 13-14,	2	5	150, 20, 40, 130, 160	4	.....	100	500
	Dallas,	Jan. 5-6,	2	5	75, 175, 260, 216, 350	3	.....	195	976
	Townline,	Jan. 7-8,	2	5	105, 140, 225, 220, 200	4	.....	190	950
Luzerne,	Conyngham,	Jan. 9-10,	2	5	75, 110, 210, 230, 300	4	.....	197	985
	Pine Run,	Feb. 27-28,	2	4	65, 150, 180, 260	4	.....	164	655
	Limestone,	March 3,	1	2	120, 220	4	.....	180	340
	Warrensville,	March 4-5,	2	5	50, 225, 50, 250, 270	4	.....	169	845
	Hughesville,	March 6-7,	2	5	45, 200, 40, 280, 250	4	.....	163	815
McKean,	Crosby,	Feb. 23,	1	2	23, 130	3	.....	81	162
	Farmers Valley,	Feb. 24,	1	2	40, 150	3	.....	95	190
	Eldred,	Feb. 25,	1	2	31, 150	3	.....	90	181
	Turtle Point,	Feb. 26,	1	2	50, 170	3	.....	110	220
	Transfer,	Feb. 11-12,	2	5	94, 230, 65, 230, 290	3	3	181	904
Mercer,	Jackson Center,	Feb. 13-14,	2	5	78, 176, 44, 245, 395	3	1	184	918
	Mercer,	Feb. 16-17,	2	5	52, 54, 58, 100, 195	3	3	92	459
	Clarks Mills,	Nov. 19,	1	2	120, 175	1	2	148	2,576
	(Special),								

Midlin,	McVeytown,	Feb. 6-7,	2	5	60, 80, 400, 200, 525	3	1	253	1,265
Monroe,	Milroy,	Feb. 9-10,	2	5	70, 72, 525, 160, 550	3	2	275	1,377
Montgomery,	Kunkletown,	Jan. 16-17,	2	5	16, 15, 133, 140, 186	3	.....	98	489
	Canadensis,	Jan. 19-20,	2	5	225, 75, 360, 250, 325	3	.....	109	1,175
	Effort,	Jan. 21-22,	2	5	83, 43, 160, 110, 200	3	.....	129	596
	Trappe,	Jan. 14-15,	2	5	45, 75, 150, 150, 225	3	1	162	645
	Center Point,	Jan. 16-17,	2	5	75, 75, 160, 200, 300	3	2	134	810
	Schwenksville,	Jan. 19-20,	2	5	65, 75, 95, 185, 350	3	2	134	670
	Harleysville,	Jan. 21-22,	2	5	125, 130, 225, 275, 500	3	2	251	1,255
	East Greenville,	Jan. 23-24,	2	5	110, 150, 210, 400, 450	3	2	264	1,320
Montour,	Exchange,	Feb. 27-28,	2	5	80, 45, 280, 182, 500	3	2	157	787
	Ridgeville,	March 21,	2	5	60, 110, 200, 240, 300	3	.....	105	315
Northampton,	Bangor,	Feb. 2-3,	1	5	16, 148, 151	2	.....	182	910
	Nazareth,	Feb. 4-5,	2	5	90, 80, 250, 290, 450	4	.....	232	1,150
Northumberland,	Cherryville,	Feb. 6-7,	2	5	75, 90, 260, 180, 280	4	1	185	925
	Rehuck,	Feb. 20-21,	2	5	74, 75, 210, 315, 250	3	.....	165	827
	Pottsgrove,	Feb. 23-24,	2	5	140, 168, 190, 199, 250	4	.....	177	988
	McEwensville,	Feb. 25-26,	2	5	64, 68, 200, 500, 250	4	.....	175	872
Perry,	Landisburg,	Dec. 29-30,	2	5	130, 210, 130, 280, 400	3	1	230	1,150
	Ickesburg,	Dec. 31-Jan. 1,	2	5	75, 70, 325, 300, 356	3	1	224	1,122
(Special),	New Bloomfield,	Dec. 19,	1	5	30, 45, 200	4	.....	91	275
Philadelphia,	Bustleton,	Jan. 23-24,	2	5	60, 210, 357, 65, 253	4	12	189	945
	Paupack,	Dec. 17-18,	2	5	35, 140, 250, 200, 273	4	.....	152	910
Pike,	Greentown,	Dec. 19-20,	2	5	40, 110, 200, 270, 450	4	3	208	1,040
Potter,	Egypt Mills,	Jan. 23-24,	2	5	35, 36, 64, 16	4	.....	37	17
	Uyesses,	Dec. 17-18,	2	5	90, 200, 37, 160, 206	4	.....	137	687
Schuylkill,	Gold,	Dec. 19-20,	2	5	30, 30, 160, 70, 150	3	.....	102	410
	Sweden Valley,	Dec. 22-23,	2	5	30, 150, 70, 125, 130	3	.....	101	505
	Friedensburg,	Feb. 16-17,	2	5	50, 123, 50, 120, 160	3	.....	161	503
	Valley View,	Feb. 18-19,	2	5	50, 40, 250, 180, 300	3	.....	164	830
	Barnesville,	Feb. 20-21,	2	5	48, 55, 220, 220, 275	3	.....	163	818
	Lewistown,	Feb. 23-24,	2	5	95, 100, 110, 210, 240	4	.....	133	665
Snyder,	Freeburg,	Feb. 11-12,	2	5	150, 70, 170, 275, 300	4	.....	121	755
	Poswell,	Jan. 19-20,	2	5	44, 200, 300, 550, 600, 750	3	4	193	965
Somerset,	Somerset,	Jan. 21-22,	2	5	200, 300, 380, 400, 110, 130	3	.....	407	2,444
	Salisbury,	Jan. 23-24,	2	5	60, 140, 148, 450, 320	3	1	253	1,520
Sullivan,	Muncy Valley,	March 9-10,	2	5	25, 200, 30, 150, 200	3	2	219	1,098
	Colley,	March 11-12,	2	5	60, 185, 50, 200, 210	4	.....	121	605
Susquehanna,	West Auburn,	Nov. 28-29,	2	5	60, 60, 85, 100, 215, 210	3	.....	147	735
	Rush,	Dec. 1-2,	2	5	25, 60, 85, 135, 160	3	1	128	640
	South Montrose,	Dec. 3-4,	2	5	10, 20, 130, 165, 160	3	.....	85	425
	Gibson,	Dec. 5-6,	2	5	30, 65, 60, 125, 200	3	1	97	485
	Liberty,	Dec. 8-9,	2	5	100, 240, 200, 250	3	.....	96	480
	Mansfield,	Dec. 10-11,	2	5	200, 350, 150, 350	3	.....	197	790
	Mitchells Mills,	Dec. 12,	2	5	150, 275, 200, 225	3	3	262	1,050
	Tioga,	Dec. 13,	2	5	75, 300, 50, 200	3	1	212	850
	Westfield,	Dec. 15-16,	2	5	55, 200, 110, 200	3	.....	382	1,150
	Wellsboro,	March 25-26,	2	5	54, 54, 100, 94, 175	3	1	156	635
(Special),	Balsam,	Feb. 16-17,	2	5	25, 23, 250, 60, 500	4	.....	225	200
Union,	Mifflinburg,	Feb. 18-19,	2	5		2	.....	141	545
	Winfield,	Oct. 21,	2	5		4	.....	75	373
(Special),	Lewisburg,		1	5		4	.....	94	466
			1	5		1	.....	500	1,339

PENNSYLVANIA FARMERS' INSTITUTES--SEASON OF 1913-1914--Continued.

County	Place	Date	Days of institute.	Number of sessions	Attendance by Sessions.			Speakers Present		Attendance	
								State	Local	Average	Total
Venango (School).	Franklin.	Dec. 29-Jan. 1.	2	6	60,	25,	60,	4	2	77	460
Warren.	Russell.	Jan. 14-15.	2	5	65,	50,	80,	2	1	116	580
	Sugarcrope.	Jan. 16-17.	2	5	35,	50,	140,	4	4	77	385
	Lottsville.	Jan. 19-20.	2	5	75,	100,	35,	4	1	112	560
Washington.	Claysville.	Dec. 3-4.	2	4	16,	80,	95,	3	1	154	615
	Washington.	Dec. 5-6.	2	5	60,	85,	35,	4	1	101	505
	Hickory.	Dec. 8-9.	2	5	65,	165,	70,	4	1	110	550
Wayne.	Honesdale.	Dec. 10-11.	2	5	60,	70,	75,	3	1	111	555
	Waymart.	Dec. 12-13.	2	5	70,	80,	160,	3	1	102	510
	Ariel.	Dec. 15-16.	2	5	50,	75,	100,	3	1	125	625
	Sterling.	Jan. 9-10.	2	5	60,	60,	200,	4	1	149	745
Westmoreland.	Latrobe.	Jan. 12-13.	2	5	105,	115,	170,	4	1	165	825
	Greensburg.	Jan. 14-15.	2	6	90,	260,	235,	3	1	243	1,460
	Scottsdale.	Jan. 16-17.	2	5	25,	30,	100,	3	1	155	777
(Special).	Irwin.	April 3-4.	2	5	40,	60,	55,	2	1	68	340
Wyoming.	Meshoppen.	March 13-14.	2	5	35,	57,	50,	4	1	126	600
	Tunkhannock.	March 16-17.	2	5	200,	300,	50,	4	1	106	582
York.	Lewisberry.	Jan. 30-31.	2	5	125,	100,	450,	3	1	258	1,290
	Loganville.	Feb. 2-3.	2	5	200,	200,	500,	3	1	370	1,850
	Fawn Grove.	Feb. 4-5.	2	5	600,	850,	350,	3	1	780	3,900
	Red Lion.	Feb. 6-7.	2	5	300,	700,	200,	3	1	480	2,400
	Dover.	Feb. 9-10.	2	5	250,	150,	600,	3	1	401	2,005
	Wellsville.	Feb. 11-12.	2	5				3			
Total.			443	1,103							174,260

MEETING OF FARMERS ANNUAL INSTITUTE.

PROGRAM.

First Session Convenes Tuesday Afternoon, May 26, 1914.

MR. F. S. BRONG, Saylorsburg, Pa., Chairman.

Call to order 1.30.

Address of Welcome, Hon. Chas. B. Staples, Judge, Stroudsburg, Pa.
C. L. Edinger, Burgess, Stroudsburg, Pa.

Response, Hon. A. L. Martin, Director of Institutes, Harrisburg, Pa.
E. B. Dorsett, Farm Adviser, Mansfield, Pa.

1. "BEEF PRODUCTION IN PENNSYLVANIA."

Prof. W. H. Tomhave, Department of Animal
Husbandry, State College, State College,
Pa.

Tuesday Evening, May 26, 1914.

WOMENS' SESSION

MRS. MARTHA E. MARTIN, Harrisburg, Pa., President.

Call to order 7.30.

1. "CLUB ORGANIZATION FOR COUNTRY GIRLS."

Mrs. Linn J. Crawford, Cooperstown, Pa.

2. "SCHOOL HYGIENE."

Miss Elizabeth Hughes Conard, Westgrove,
Pa.

3. "LITTLE THINGS."

Dr. Hannah McK. Lyons, Lincoln University,
Pa.

4. "WATER SUPPLY AND DRAINAGE IN THE FARM HOME."

Mrs. Jean Kane Foulke, West Chester, Pa.

Wednesday Morning, May 27, 1914.

MR. C. S. MESSINGER, Tatamy, Pa., Chairman.

Call to order 9.30.

SOIL IMPROVEMENT SESSION

1. "FERTILITY REGAINED AND RETAINED."

R. P. Kester, Newtown, Pa.

2. "LIME: ITS VALUE AND THE DIFFERENT FORMS."

Prof. M. S. McDowell, Department of Agricultural Extension, State College, State College, Pa.

3. "HUMUS IN THE SOIL."

Robert S. Seeds, Birmingham, Pa.

4. "HOW NATURE MAKES SOIL."

(Illustrated with lantern slides).

J. T. Campbell, Hartstown, Pa

Wednesday Afternoon, May 27, 1914.

MR. B. F. WAMBOLD, Sellersville, Chairman.

Call to order 1.30.

1. "PRODUCTION AND MARKETING OF DAIRY PRODUCTS."

L. W. Lighty, East Berlin, Pa.

2. "HOW MUCH MILK PER ACRE AND WHAT GRAINS FOR THE DAIRY COW."

Prof. H. P. Davis, Department of Animal Husbandry, State College, State College, Pa.

3. "COMPARATIVE TYPE OF THE DAIRY BREED."

Dr. M. E. Conard, Westgrove, Pa.

4. "COW TESTING ASSOCIATIONS."

Prof. F. R. Stevens, Agriculturist, Philadelphia, Pa.

Wednesday Evening, May 27, 1914.

B. F. KILLAM, Esq., Paupack, Pa., Chairman.

Call to order 7.30.

1. "THE VALUE OF VIGOR IN POULTRY."

Prof. T. F. McGrew, Principal, School of Poultry Husbandry, International Correspondence School, Scranton, Pa.

2. "PROFITABLE EGG PRODUCTION."

(Illustrated with lantern slides).

Prof. H. R. Lewis, New Brunswick, N. J.

3. "TURKEY RAISING; HOW TO SUCCEED."

(Illustrated with lantern slides).

C. M. Barnitz, Riverside, Pa.

Thursday Morning, May 28, 1914.

A. L. MARTIN, Director, Harrisburg, Pa., Chairman.

FARMERS' INSTITUTE SESSION

Call to order 9.30.

This session as well as the afternoon session will be devoted to General Discussion for the development of questions relating to the INSTITUTE, MOVABLE SCHOOLS and ADVISORY WORK, throughout the State.

Opened by A. L. MARTIN, Director.

1. "THE RELATION OF THE GRANGE TO FARMERS' INSTITUTES "

E. B. Dorsett, Mansfield, Pa.

2. "HOW CAN COUNTY AGRICULTURAL SOCIETIES BECOME MORE EFFECTIVE IN FURTHERING FARMERS' INSTITUTE WORK."

Prof. Franklin Menges, York, Pa.

3. "THE FARMERS' CLUBS OF PENNSYLVANIA AS A FACTOR IN THE WORK."

T. H. Smith, Dunbar, Pa.

Note: It is expected that County Chairmen of Institutes and Institute Lecturers will be prepared to enter into the discussion.

Thursday Afternoon, May 28, 1914.

FARMERS' INSTITUTE SESSION (Continued).

Call to order 1.30.

4. "THE MOVABLE SCHOOL: WHAT TOPICS AND HOW SAME CAN BE BEST DIVIDED IN ORDER TO MEET LOCAL CONDITIONS."

R. J. Weld, Sugargrove, Pa.

5. "FIELD EXPERIENCE AND SUGGESTIONS OF FARM ADVISERS."

(Five minutes each).

Chas. G. McClain, Brookville, Pa.

Dr. M. E. Conard, Westgrove, Pa.

E. B. Dorsett, Mansfield, Pa.

Mrs. Jean Kane Foulke, West Chester, Pa.

Sheldon W. Funk, Boyertown, Pa.

R. P. Kester, Newtown, Pa.

Frank Kline, Spring City, Pa.

L. W. Lighty, East Berlin, Pa.

Prof Franklin Menges, York, Pa.

W. Theo Wittman, Mt. Gretna, Pa.

6. "THIS PERIOD WILL BE DEVOTED TO THE IMPROVEMENT OF INSTITUTE WORK."

Note: County Chairmen and Lecturers are requested to present their views as to the best method to pursue in order to build up the work throughout the State.

(Five minutes allotted to each member).

Thursday Evening May 28, 1914.

MR. J. E. HILDEBRANT, Dallas, Pa., Chairman.

Call to order at 7.30.

1. "APPLES: STARTING THE YOUNG ORCHARD AND TREATMENT OF BEARING TREES."

Sheldon W. Funk, Boyertown, Pa.

2. "HANDLING AND MARKETING APPLES."

F. H. Fassett, Meshoppen, Pa.

3. "TRUCK FARMING: THE MAN, THE BUSINESS AND THE CROP."

C. C. Hulsart, Matawan, N. J.

LIST OF COUNTY INSTITUTE MANAGERS FOR THE SEASON OF 1913-14.

County.	Name and Address of Chairmen.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	A. J. Purdy, Imperial, R. D.
Armstrong,	S. S. Blyholder, Kelly Station.
Beaver,	Walter C. Dunlap, West Bridgewater.
Bedford,	W. F. Biddle, Everett, R. D. No. 2.
Berks,	H. G. McGowan, Geigers Mills.
Blair,	W. Frank Beck, Altoona.
Bradford,	F. D. Kerrick, Towanda, R. D. No. 9.
Bucks,	B. F. Wambold, Sellersville.
Butler,	W. H. Milliron, Euclid.
Cambria,	L. J. Bearer, Hastings, R. D.
Cameron,	R. P. Heilman, Emporium.
Carbon,	Edward Lienhard, Mauch Chunk, R. D. No. 1.
Center,	John A. Woodward, Howard.
Chester,	M. E. Conard, Westgrove.
Clarion,	J. H. Wilson, Clarion.
Clearfield,	Harrison Straw, Clearfield.
Clinton,	Joel A. Herr, Millhall.
Columbia,	A. P. Young, Millville.
Crawford,	W. F. Throop, Espyville, Pa.
Cumberland,	T. J. Ferguson, Mechanicsburg.
Dauphin,	E. S. Keiper, Middletown.
Delaware,	Thos. H. Wittkorn, Media.
Elk,	John G. Schmidt, St. Marys.
Erie,	John J. Rouse, Wattsburg.
Fayette,	John T. Smith, Dunbar, R. D. No. 32.
Forest,	C. A. Randall, Tionesta.
Franklin,	J. P. Young, Marion.
Fulton,	Frank Ranck, Hancock, Md.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	G. G. Hutchison, Warriors Mark.
Indiana,	S. C. George, West Lebanon.
Jefferson,	Peter B. Cowan, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Horace Seamans, Factoryville.
Lancaster,	J. Aldus Herr, Lancaster, R. D. No. 4.
Lawrence,	Sylvester Shaffer, New Castle, R. D. No. 4.
Lebanon,	Edward Shuey, Lickdale.
Lehigh,	P. S. Fenstermacher, Allentown.
Luzerne,	J. E. Hildebrant, Dallas.
Lycoming,	A. J. Kahler, Hughesville.
McKean,	E. A. Studholme, Smethport.
Mercer,	Wm. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Monroe,	F. S. Brong, Saylorsburg.

County.	Name and Address of Chairmen.
Montgomery,	J. H. Schultz, Norristown.
Montour,	J. Miles Derr, Milton, R. D. No. 1.
Northampton,	C. S. Messinger, Tatamy, R. D.
Northumberland,	I. A. Eschbach, Milton, R. D. No. 1.
Philadelphia,	S. K. Foster, Torresdale.
Perry,	C. M. Bower, Blain.
Pike,	B. F. Killam, Paupack.
Potter,	A. T. Crittenden, Oswayo.
Schuykill,	John Shoener, New Ringgold.
Snyder,	F. F. Glass, Freeburg.
Somerset,	J. C. Weller, Rockwood.
Sullivan,	E. R. Warburton, Campbellville.
Susquehanna,	F. A. Davies, Montrose.
Tioga,	C. H. De Witt, Mansfield.
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	G. A. Woodside, Sugargrove.
Washington,	Jas. M. Paxton, Houston.
Wayne,	W. E. Perham, Varden.
Westmoreland, ..	W. F. Holtzer, Greensburg.
Wyoming,	G. A. Benson, Tunkhannock
York,	G. F. Barnes, Rossville.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1913-1914.

Anderson, H. M., New Park, Pa.
Barnitz, C. M., Riverside, Pa.
Bell, R. H., State College, Pa.
Bond, M. S., Danville, Pa.
Campbell, J. T., Hartstown, Pa.
Conard, Dr. M. E., Westgrove, Pa.
Card, Fred W., Sylvania, Pa.
Cox, J. F., State College, Pa.
Cornman, C. T., Carlisle, Pa.
Darst, W. H., State College, Pa.
Davis, H. P., State College, Pa.
Dorsett, E. B., Mansfield, Pa.
Fassett, F. H., Meshoppen, Pa.
Foulke, Mrs. Jean Kane, West Chester, Pa.
Funk, Dr. J. H., Boyertown, Pa.
Funk, Sheldon W., Boyertown, Pa.
Gardner, Prof. Frank D., State College, Pa.
Given, G. C., State College, Pa.
Gooderham, H. M., Patton, Pa.
Goodling, C. L., State College, Pa.
Groupe, J. Stuart, Jersey Shore, Pa., R. D. No. 4.
Havner, H. H., State College, Pa.
Hibshman, E. K., State College, Pa.
Hulsart, C. C., Matawan, N. J.
Kester, R. P., Newtown, Pa.
Johnston, J. B., New Wilmington, Pa.
Kline, Frank, Spring City, Pa.
Kraybill, H. R., State College, Pa.
Lighty, L. W., East Berlin, Pa., R. D.
McCallum, M. H., Wernersville, Pa.
Lyons, Dr. Hannah McK., Lincoln University, Pa.
Menges, Prof. Franklin, York, Pa.
Mitman, Howard, Hellertown, Pa.
Noll, C. F., State College, Pa.
Patton, W. M., Mosgrove, Pa., R. D. No. 2.
Phillips, E. L., New Bethlehem, Pa.
Putney, Fred S., State College, Pa.
Row, Chas. A., Yardley, Pa.
Seeds, Robt. S., Birmingham, Pa.
Severson, B. O., State College, Pa.
Stevens, Prof. F. R., Philadelphia, Pa.
Stout, W. H., Pinegrove, Pa.
Tomhave, W. H., State College, Pa.
Van Noy, Leon Otice, Troy, Pa., R. D. No. 66.
Warner, David E., State College, Pa.
Watts, D. H., Kerrmoor, Pa.
Weld, R. J., Sugargrove, Pa.
White, W. R., State College, Pa.
Wittmann, W. Theo., Allentown, Pa.
Worthen, E. L., State College, Pa.
Wrigley, Paul I., Eddington, Pa.

THE FOLLOWING IS A LIST OF SPEAKERS AND THEIR ASSIGNMENTS, SEASON OF 1913-1914.

H. M. ANDERSON, New Park, York County, Pa.

	Date.	Place.	County.
Jan.	7,.....	Newburg,	Cumberland.
Jan.	8-9,.....	Oakville,	Cumberland.
Jan.	10,.....	Hogestown,	Cumberland.
Jan.	12-13,.....	New Cumberland,	Cumberland.
Jan.	14-15,.....	Womelsdorf,	Berks.
Jan.	16-17,.....	Centerport,	Berks.
Jan.	19-20,.....	Geigertown,	Berks.
Jan.	21-22,.....	Jacksonwald,	Berks.
Jan.	23-24,.....	Bustleton,	Philadelphia.

C. M. BARNITZ, Riverside, Northumberland County, Pa.

Jan.	30-31,.....	Lewisburg,	York.
Feb.	2-3,.....	Loganville,	York.
Feb.	4-5,.....	Fawn Grove,	York.
Feb.	6-7,.....	Red Lion,	York.
Feb.	9-10,.....	Dover,	York.
Feb.	11-12,.....	Wellsville,	York.
Feb.	13-14,.....	York Springs,	Adams.
Feb.	16-17,.....	Arendtsville,	Adams.
Feb.	18-19,.....	Fairfield,	Adams.
Feb.	20-21,.....	Scotland,	Franklin.
Feb.	23-24,.....	Marion,	Franklin.
Feb.	25-26,.....	Waynesboro,	Franklin.
Feb.	27-28,.....	Dry Run,	Franklin.
March	2-3,.....	Media,	Delaware.
March	4-5,.....	Concordville,	Delaware.

R. H. Bell, State College, Centre County, Pa.

Dec.	29-30,.....	Pine Grove Mills,	Centre.
Dec. 31, Jan. 1,.....	Rebersburg,	Centre.	
Jan.	2-3,.....	Jacksonville,	Centre.

M. S. BOND, Danville, Montour County, Pa.

Dec.	15-16,.....	Sterling,	Wayne.
Dec.	17-18,.....	Paupack,	Pike.
Dec.	19-20,.....	Greentown,	Pike.

J. T. CAMPBELL, Hartstown, Crawford County, Pa.

Will attend all meetings in the Third Section.

Dr. M. E. CONARD, Westgrove, Chester County, Pa.

Will attend Movable Institute Schools Dec. 3 to Jan. 16, and Farmers' Institutes in Fourth Section from February 2 to March 17.

FRED W. CARD, Sylvania, Bradford County, Pa.

Will attend all meetings in the Fifth Section(part one), from Nov. 28 to Jan. 3 and from Feb. 16 to Feb. 24; Fifth Section (part two) from Jan. 5 to Jan. 24.

J. F. COX, State College, Centre County, Pa.

	Date.	Place.	County.
Feb.	9-10,.....	New Bethlehem,	Clarion.
Feb.	11-12,.....	Sligo,	Clarion.
Feb.	13-14,.....	Foxburg,	Clarion.

CHAS. T. CORNMAN, Carlisle, Cumberland County, Pa.

Jan.	23-24,.....	Bustleton,	Philadelphia.
Feb.	23-24,.....	Pottsgrove,	Northumberland.
Feb.	25-26,.....	McEwensville,	Northumberland.
Feb.	27-28,.....	Exchange,	Montour.
March	2-3,.....	Grovania,	Montour.
March	4-5,.....	McAllisterville,	Juniata.
March	6-7,.....	Port Royal,	Juniata.

W. H. DARST, State College, Centre County, Pa.

Jan.	19-29,.....	Canadensis,	Monroe.
Jan.	21-22,.....	Effort,	Monroe.
Jan.	23-24,.....	Egypt Mills,	Pike.

H. P. DAVIS, State College, Centre County, Pa.

Nov.	28-29,.....	Pine Bank,	Greene.
Dec.	1-2,.....	Sycamore,	Greene.
Dec.	3-4,.....	Claysville,	Washington.
Dec.	5-6,.....	Washington,	Washington.

E. B. DORSETT, Mansfield, Tioga County, Pa.

Will attend all meetings in the Third Section from December 15 to Dec. 23; Second Section Jan. 12 to Jan. 24 and First Section from Jan. 30 to March 5.

F. H. FASSETT, Meshoppen, Wyoming County, Pa.

Will attend Movable Institute Schools Dec. 1 to Jan 13; Farmers' Institutes in the Second Section Dec. 8 to Dec. 11 and March 2 to March 7; Fifth Section (part one) Jan. 14 to Feb. 14 and the Fourth Section from Feb. 16 to Feb. 28.

MRS. JEAN KANE FOULKE, West Chester, Chester County, Pa.

	Date.	Place.	County.
Nov.	25-26,.....	Athens,	Bradford.
Nov.	28-29,.....	Rome,	Bradford.
Dec.	1-2,.....	Canton,	Bradford.
Dec.	3-4,.....	Troy,	Bradford.
Dec.	5-6,.....	Liberty,	Tioga.
Dec.	8-9,.....	Mansfield,	Tioga.
Dec.	10-11,.....	Mitchells Mills,	Tioga.
Dec.	12,.....	Tioga,	Tioga.
Dec.	13,.....	Wellsboro,	Tioga.
Dec.	15-16,.....	Westfield,	Tioga.
Dec.	17-18,.....	Ulysses,	Potter.
Dec.	19-20,.....	Gold,	Potter.
Dec.	22-23,.....	Sweden Valley,	Potter.
Dec.	29-30,.....	Woolrich,	Clinton.
Dec 31, Jan. 1,.....	Logantown,	Clinton.	
Jan.	2-3,.....	Beech Creek,	Clinton.
Feb.	27-28,.....	Pinerun,	Lycoming.
March	2-3,.....	Limestone,	Lycoming.
March	4-5,.....	Warrensville,	Lycoming.
March	6-7,.....	Hughesville,	Lycoming.

Dr. J. H. FUNK, Boyerstown, Berks County, Pa.

Jan.	14-15,.....	Trappe,	Montgomery.
Jan.	16-17,.....	Centre Point,	Montgomery.
Jan.	19-20,.....	Schwenksville,	Montgomery.
Jan.	21-22,.....	Harleysville,	Montgomery.
Jan.	23-24,.....	East Greenville,	Montgomery.
Feb.	25-26,.....	Springtown,	Bucks.
Feb.	27-28,.....	Sellersville,	Bucks.
March	2-3,.....	Doylestown,	Bucks.
March	4-5,.....	Pineville,	Bucks.

SHELDON W. FUNK, Boyerstown, Berks County, Pa.

Will attend all meetings in the Third Section from Nov. 28 to Dec. 23; Second Section from Feb. 2 to Feb. 28; First Section Dec. 29 to Jan. 22.

PROF. FRANK D. GARDNER, State College, Centre County, Pa.

March	2-3,.....	Limestone,	Lycoming.
March	4-5,.....	Warrensville,	Lycoming.
March	6-7,.....	Hughesville,	Lycoming.

G. C. GIVEN, State College, Centre County, Pa.

Jan.	12,.....	Weatherly,	Carbon.
Jan.	13,.....	Big Creek,	Carbon.
Jan.	14-15,.....	New Mahoning,	Carbon.
Jan.	16-17,.....	Kunkletown,	Monroe.

H. M. GOODERHAM, Patton, Cambria County, Pa.

	Date.	Place.	County.
Dec.	12-13,.....	Pleasant Valley,	Bedford.
Dec.	15-16,.....	New Paris,	Bedford.
Dec.	17-18,.....	Osterburg,	Bedford.
Dec.	29-30,.....	Pine Grove Mills,	Centre.
Dec. 31, Jan. 1,.....	Rebersburg,	Centre.	
Jan.	2-3,.....	Jacksonville,	Centre.
Jan.	5-6,.....	Kerrmoor,	Clearfield.
Jan.	7-8,.....	Goshen,	Clearfield.
Jan.	9-10,.....	Karthus,	Clearfield.
March	9-10,.....	Muncy Valley,	Sullivan.
March	11-12,.....	Colley,	Sullivan.
March	13-14,.....	Meshoppen,	Wyoming.
March	16-17,.....	Tunkhannock,	Wyoming.

C. L. GOODLING, State College, Centre County, Pa.

Jan.	12-13,.....	Baxter,	Jefferson.
Jan.	14-15,.....	Russell,	Warren.
Jan.	16-17,.....	Sugargrove,	Warren.
Jan.	19-20,.....	Lottsville,	Warren.
Jan.	21-22-23,.....	Emporium,	Cameron.

J. STUART GROUPE, Jersey Shore, R. D. No. 4, Lycoming County, Pa.

Nov.	28-29,.....	West Auburn,	Susquehanna.
Dec.	1-2,.....	Rush,	Susquehanna.
Dec.	3-4,.....	South Montrose,	Susquehanna.
Dec.	5-6,.....	Gibson,	Susquehanna.
Dec.	8-9,.....	Honesdale,	Wayne.
Dec.	10-11,.....	Waymart,	Wayne.
Dec.	12-13,.....	Ariel,	Wayne.
Jan.	5-6,.....	Kerrmoor,	Clearfield.
Jan.	7-8,.....	Goshen,	Clearfield.
Jan.	9-10,.....	Karthus,	Clearfield.
Jan.	12-13,.....	Bellwood,	Blair.
Jan.	14-15,.....	Geeseytown,	Blair.
Jan.	16-17,.....	East Freedom,	Blair.

H. H. HAVNER, State College, Centre County, Pa.

Feb.	9-10,.....	Atlantic,	Crawford.
Feb.	11-12,.....	Transfer,	Mercer.
Feb.	13-14,.....	Jackson Center,	Mercer.

E. K. HIBSHMAN, State College, Centre County, Pa.

Dec.	5-6,.....	Maytown,	Lancaster.
Dec.	8-9,.....	Mechanicsville,	Lancaster.
Dec.	10-11,.....	Lititz,	Lancaster.
Dec.	12-13,.....	Ephrata,	Lancaster.
Dec.	15-16,.....	Lampeter,	Lancaster.
Dec.	17-18,.....	Paradise,	Lancaster.
Dec.	19,.....	Millersville,	Lancaster.
Dec.	20,.....	Blue Ball,	Lancaster.

CHAS. C. HULSART, Matawan, N. J.

	Date.	Place.	County.
Nov.	28-29,.....	Middletown,	Dauphin.
Dec.	1-2,.....	Gratz,	Dauphin.
Dec.	3-4,.....	Linglestown,	Dauphin.
Dec.	5-6,.....	Maytown,	Lancaster.
Dec.	8-9,.....	Mechanicsville,	Lancaster.
Dec.	10-11,.....	Lititz,	Lancaster.
Dec.	12-13,.....	Ephrata,	Lancaster.
Dec.	15-16,.....	Lampeter,	Lancaster.
Dec.	17-18,.....	Paradise,	Lancaster.
Dec.	19,.....	Millersville,	Lancaster.
Dec.	20,.....	Blue Ball,	Lancaster.
Jan.	5-6,.....	Dallas,	Luzerne.
Jan.	7-8,.....	Town Line,	Luzerne.
Jan.	9-10,.....	Conyngham,	Luzerne.
Jan.	12,.....	Weatherly,	Carbon.
Jan.	13,.....	Big Creek,	Carbon.
Jan.	14-15,	Trappe,	Montgomery.
Jan.	16-17,.....	Centre Point,	Montgomery.
Jan.	19-20,.....	Schwenksville,	Montgomery.
Jan.	21-22,.....	Harleysville,	Montgomery.
Jan.	23-24,.....	East Greenville,	Montgomery.

R. P. KESTER, Grampian, Clearfield County, Pa.

Will attend all meetings in the Fourth Section.

J. B. JOHNSTON, New Wilmington, Lawrence County, Pa.

Nov.	28-29,.....	Houstontown,	Fulton.
Dec.	1-2,.....	Enid,	Fulton.
Dec.	3-4,.....	Orbisonia,	Huntingdon.
Dec.	5-6,.....	McAlevys Fort,	Huntingdon.

FRANK KLINE, Spring City, Chester County, Pa.

Dec.	5-6,.....	Maytown,	Lancaster.
Dec.	8-9,.....	Mechanicsville,	Lancaster.
Dec.	10-11,.....	Lititz,	Lancaster.
Dec.	12-13,.....	Ephrata,	Lancaster.
Dec.	15-16,.....	Lampeter,	Lancaster.
Dec.	17-18,.....	Paradise,	Lancaster.
Dec.	19,.....	Millersville,	Lancaster.
Dec.	20,.....	Blue Ball,	Lancaster.
Dec.	29-30,.....	Woolrich,	Clinton.
Dec. 31, Jan. 1,.....	Logantown,	Clinton.	
Jan.	2-3,.....	Beech Creek,	Clinton.
Jan.	5-6,.....	St. Marys,	Elk.
Jan.	7-8,.....	Kersey,	Elk.
Jan.	9-10,.....	Ringgold,	Jefferson
Jan.	12-13,.....	Baxter,	Jefferson.
Jan.	14-15,.....	Russell,	Warren.
Jan.	16-17,.....	Sugargrove,	Warren.
Jan.	19-20,.....	Lottsville,	Warren.
Jan.	21-22-23,.....	Emporium,	Cameron.

Dr. LOUIS A. KLEIN, No. 36th and Woodland Avenues, Philadelphia, Pa.

	Date.	Place.	County.
Dec.	3-4,.....	Jonestown,	Lebanon.
Dec.	5-6,.....	Centerville,	Cumberland.

H. R. KRAYBILL, State College, Centre County, Pa.

Jan.	30-31,.....	Lewisberry,	York.
Feb.	2-3,.....	Loganville,	York.
Feb.	4-5,.....	Fawn Grove,	York.
Feb.	6-7,.....	Red Lion,	York.
Feb.	9-10,.....	Dover,	York.

L. W. LIGHTY, East Berlin, Adams County, Pa.

Will attend all meetings in the Fifth Section (part one).

M. H. McCALLUM, Wernersville, Berks County, Pa.

Will attend all meetings in the Third Section from Nov. 28 to Dec. 13 and Feb. 18 to March 10; Fifth Section Dec. 27 to Jan. 15 and from Feb. 9 to Feb. 14.

Dr. HANNAH McK. LYONS, Lincoln University, Chester County, Pa.

Jan.	1,.....	Franklin,	Vanango.
Jan.	2,.....	Westfield,	Lawrence.
Jan.	3,.....	Westfield,	Lawrence.
Jan.	6,.....	Brushvalley,	Indiana.
Jan.	7,.....	Lewisville,	Indiana.
Jan.	8,.....	Butler,	Butler.
Jan.	9-10,.....	Geistown,	Cambria.
Jan.	12-13,.....	Bloomsburg,	Columbia.
Feb.	24,.....	Pottsgrove,	Northumberland.
Feb.	25,.....	McEwensville,	Northumberland.

PROF. FRANKLIN MENGES, York, York County, Pa.

Will attend all meetings in the Second Section.

HOWARD MITMAN, Hellertown, Northampton County, Pa.

Dec.	29-30,.....	Landisburg,	Perry.
Dec. 31, Jan. 1,	.....	Ickesburg,	Perry.
Jan.	2-3,.....	Annville,	Lebanon.
Jan.	5-6,.....	Schaefferstown,	Lebanon.
Feb.	9-10,.....	Macungie,	Lehigh.
Feb.	11-12,.....	Laurys,	Lehigh.
Feb.	13-14,.....	New Tripoli,	Lehigh.
March	9-10,.....	Muncy Valley,	Sullivan.
March	11-12,.....	Colley,	Sullivan.
March	13-14,.....	Meshoppen,	Wyoming.
March	16-17,.....	Tunkhannock,	Wyoming.

C. F. NOLL, State College, Centre County, Pa.

Date.	Place.	County.
Feb. 2-3,.....	Bangor,	Northampton.
Feb. 4-5,.....	Nazareth,	Northampton.
Feb. 6-7,.....	Cherryville,	Northampton.

W. M. PATTON, Mosgrove, R. D. No. 2, Armstrong County, Pa.

Nov. 28-29,.....	Houstontown,	Fulton.
Dec. 1-2,.....	Enid,	Fulton.
Dec. 3-4,.....	Orbisonia,	Huntingdon.
Dec. 5-6,.....	McAlevys Fort,	Huntingdon.
Dec. 8-9,.....	Warriors Mark,	Huntingdon.
Dec. 10-11,.....	Markelsburg,	Huntingdon.
Dec. 12-13,.....	Pleasant Valley,	Bedford.
Dec. 15-16,.....	New Paris,	Bedford.
Dec. 17-18,.....	Osterburg,	Bedford.
Feb. 23-24,.....	Plaingrove,	Lawrence.
Feb. 25-26,.....	Slippery Rock,	Butler.
Feb. 27-28,.....	Prospect,	Butler.
March 2-3,.....	Jefferson Grange Hall, ..	Butler.
March 4-5,.....	Dayton,	Armstrong.
March 6-7,.....	Elderton,	Armstrong.
March 9-10,.....	Spring Church,	Armstrong.

J. H. PEACHEY, Belleville, Mifflin County, Pa.

Nov. 28-29,.....	Middletown,	Dauphin.
Dec. 1-2,.....	Gratz,	Dauphin.
Dec. 3-4,.....	Linglestown,	Dauphin.
Dec. 5-6,.....	Maytown,	Lancaster.
Dec. 29-30,.....	Smicksburg,	Indiana.
Dec. 31, Jan. 1,.....	Marion Center,	Indiana.
Jan. 2-3,.....	Willet,	Indiana.
Jan. 5-6,.....	Brushvalley,	Indiana.
Jan. 7-8,.....	Lewisville,	Indiana.
Jan. 9-10,.....	Latrobe,	Westmoreland.
Jan. 12-13,.....	Greensburg,	Westmoreland.
Jan. 14-15,.....	Scottdale,	Westmoreland.
Jan. 16-17,.....	Irwin,	Westmoreland.
Feb. 2-3,.....	Mosiertown,	Crawford.
Feb. 4-5,.....	Blooming Valley,	Crawford.
Feb. 6-7,.....	Conneaut Lake,	Crawford.

E. L. PHILLIPS, New Bethlehem, R. D. No. 2, Clarion County, Pa.

	Date.	Place.	County.
Dec.	8-9,.....	Mansfield,	Tioga.
Dec.	10-11,.....	Mitchells Mills,	Tioga.
Dec.	12,.....	Tioga,	Tioga.
Dec.	13,.....	Wellsboro,	Tioga.
Dec.	15-16,.....	Westfield,	Tioga.
Dec.	17-18,.....	Ulysses,	Potter.
Dec.	19-20,.....	Gold,	Potter.
Dec.	22-23,.....	Sweden Valley,	Potter.
Feb.	2-3,.....	Patton,	Cambria.
Feb.	4-5,.....	Ebensburg,	Cambria.
Feb.	6-7,.....	McVeytown,	Mifflin.
Feb.	9-10,.....	Milroy,	Mifflin.
Feb.	11-12,.....	Beavertown,	Snyder.
Feb.	13-14,.....	Freeburg,	Snyder.
Feb.	16-17,.....	Mifflinburg,	Union.
Feb.	18-19,.....	Winfield,	Union.
Feb.	20-21,.....	Rebuck,	Northumberland.

FRED S. PUTNEY, State College, Centre County, Pa.

Jan.	19-20,.....	Millerton,	Allegheny.
Jan.	21-22,.....	East Union,	Allegheny.
Jan.	23-24,.....	Carnot,	Allegheny.

CHAS. A. ROW, Yardley, Bucks County, Pa.

Nov.	25-26,.....	Athens,	Bradford.
Nov.	28-29,.....	Rome,	Bradford.
Dec.	1-2,.....	Canton,	Bradford.
Dec.	3-4,.....	Troy,	Bradford.
Dec.	5-6,.....	Liberty,	Tioga.
Dec.	8-9,.....	Mansfield,	Tioga.
Dec.	10-11,.....	Mitchells Mills,	Tioga.
Dec.	12,.....	Tioga,	Tioga.
Dec.	13,.....	Wellsboro,	Tioga.
Jan.	5-6,.....	Oxford,	Chester.
Jan.	7-8,.....	Westgrove,	Chester.
Jan.	9-10,.....	Byers,	Chester.
Jan.	12-13,.....	Cedarville,	Chester.

ROBT. S. SEEDS, Birmingham, Huntingdon County, Pa.

Dec.	30-31,.....	Franklin,	Venango.
Jan.	1-2,.....	Westfield,	Lawrence.
Jan.	3,.....	Willet,	Indiana.
Jan.	5,.....	Brushvalley,	Indiana.
Jan.	6-7,.....	Butler,	Butler.
Jan.	8-9,.....	Geistown,	Cambria.
Jan.	13-14,.....	Bloomsburg,	Columbia.
Jan.	19-20,.....	Boswell,	Somerset.
Jan.	21-22,.....	Somerset,	Somerset.
Jan.	23-24,.....	Salisbury,	Somerset.

B. O. SEVERSON, State College, Centre County, Pa.

	Date.	Place.	County.
Dec.	15-16,.....	Lampeter,	Lancaster.
Dec.	17-18,.....	Paradise,	Lancaster.
Dec.	19,.....	Millersville,	Lancaster.
Dec.	20,.....	Blue Ball,	Lancaster.

PROF. F. R. STEVENS, Agriculturist.

Nov.	25-26,.....	Athens,	Bradford.
Nov.	28-29,.....	Rome,	Bradford.
Dec.	1-2,.....	Rush,	Susquehanna.
Dec.	3-4,.....	South Montrose,	Susquehanna.
Jan.	5-6,.....	Dallas,	Luzerne.
Jan.	7-8,.....	Town Line,	Luzerne.
Jan.	9-10,.....	Conyngham,	Luzerne.
Jan.	12,.....	Weatherly,	Carbon.
Jan.	13,.....	Big Creek,	Carbon.
Feb.	16-17,.....	Friedensburg,	Schuylkill.
Feb.	18-19,.....	Valley View,	Schuylkill.
Feb.	23-24,.....	Barnsville,	Schuylkill.
March	9-10,.....	Lewistown,	Schuylkill.
March	11-12,.....	Muncy Valley,	Sullivan.
Feb.	20-21,.....	Colley,	Sullivan.
March	13-14,.....	Meshoppen,	Wyoming.
March	16-17,.....	Tunkhannock,	Wyoming.

W. H. STOUT, Pinegrove, Schuylkill County, Pa.

Jan.	5-6,.....	St. Marys,	Elk.
Jan.	7-8,.....	Kersey,	Elk.
Jan.	9-10,.....	Ringgold,	Jefferson.

W. H. TOMHAVE, State College, Centre County, Pa.

Dec.	8-9,.....	Mechanicsville,	Lancaster.
Dec.	10-11,.....	Lititz,	Lancaster.
Dec.	12-13,.....	Ephrata,	Lancaster.
Feb.	16-17,.....	Mercer,	Mercer.

LEON OTICE VAN NOY, Troy, R. D. No. 66, Bradford County, Pa.

Will attend all meetings in the Third Section from Dec. 29 to Feb. 7 and Feb. 23 to March 10; Second Section Feb. 11 to Feb. 19.

DAVID E. WARNER, State College, Centre County, Pa.

Dec.	1-2,.....	Canton,	Bradford.
Dec.	3-4,.....	Troy,	Bradford.
Dec.	5-6,.....	Liberty,	Tioga.

D. H. WATTS, Kerrmoor, Clearfield County, Pa.

Will attend all meetings in the First Section.

R. J. WELD, Sugargrove, Warren County, Pa.

	Date.	Place.	County.
Dec.	3-4,.....	Jonestown,	Lebanon.
Dec.	5-6,.....	Centerville,	Cumberland.
Dec.	8-9,.....	Needmore,	Fulton.
Dec.	15-16,.....	Westfield,	Tioga.
Dec.	17-18,.....	Ulysses,	Potter.
Dec.	19-20,.....	Gold,	Potter.
Dec.	22-23,.....	Sweden Valley,	Potter.
Dec. 31, Jan. 1,.....	Franklin,	Venango.	
Jan.	2-3,.....	Westfield,	Lawrence.
Jan.	7-8,.....	Butler,	Butler.
Jan.	9-10,.....	Geistown,	Cambria.
Jan.	14-15-16,.....	Bloomsburg,	Columbia.

W. R. WHITE, State College, Centre County, Pa.

Feb.	2-3,.....	Wales Church,	Erie.
Feb.	4-5,.....	Millvillage,	Erie.
Feb.	6-7,.....	Lundys Lane,	Erie.

W. THEO WITTMAN, Mt. Gretna, Lebanon County, Pa.

Will attend Movable Institute Schools Dec. 1 to Jan. 13; Farmers' Institutes in the Fourth Section Nov. 25 to Nov. 29; Fifth Section Dec. 15 to Dec. 20, Jan. 16 to Feb. 7 and Feb. 16 to March 5.

E. L. WORTHEN, State College, Centre County, Pa.

Dec.	8-9,.....	Hickory,	Washington.
Dec.	10-11,.....	Dunbar,	Fayette.
Dec.	12-13,.....	Smock,	Fayette.

PAUL I. WRIGLEY, Eddington, Bucks County, Pa.

Jan.	5-6,.....	Oxford,	Chester.
Jan.	7-8,.....	Westgrove,	Chester.
Jan.	9-10,.....	Byers,	Chester.
Jan.	12-13,.....	Cedarville,	Chester.

W. D. ZINN, Phillippi, W. Va.

Feb.	9-10,.....	Atlantic,	Crawford.
Feb.	11-12,.....	Transfer,	Mercer.
Feb.	13-14,.....	Jackson Center,	Mercer.
Feb.	16-17,.....	Mercer,	Mercer.
Feb.	18-19,.....	Bethel Church,	Lawrence.
Feb.	20-21,.....	Herman Church,	Lawrence.

LIST OF SPECIAL INSTITUTE INSTRUCTORS

A. R. Bechdel, State College, Pa.
W. M. Benninger, Walnutport, Pa.
M. N. Clark, Claridge, Pa.
W. M. C. Drake, Volant, Pa.
J. A. Ferguson, State College, Pa.
Dr. Wm. Frear, State College, Pa.
W. R. Gorham, State College, Pa.
J. D. Harlan, State College, Pa.
H. F. Hershey, Harrisburg, Pa., R. D. No. 2.
Joel A. Herr, Millhall, Pa., R. D.
G. G. Hutchison, Warriors Mark, Pa.
Prof. M. C. Kilpatrick, State College, Pa.
Prof. T. I. Mairs, State College, Pa.
M. S. McDowell, State College, Pa.
Mrs. Mary T. Monroe, Dryden, N. Y.
C. R. Orton, State College, Pa.
Frank P. Plessinger, Locust Grove, Pa.
B. Monroe Posten, Stroudsburg, Pa.
A. Woodward Stephens, Hoboken, Pa.
R. O. Umholtz, Sacramento, Pa.
J. W. White, State College, Pa.

DEPARTMENT LECTURERS

In so far as time and circumstances will permit, the officers of the Department of Agriculture are desirous of engaging in Institute work.

In order to prevent disappointment in the arrangement of programs, it is recommended that Institute Managers first consult the individual whose services they may wish to secure, before placing his name on the program.

Department lecturers come to these Institutes free of charge, except that they are to be taken from and to the railroad station at the expense of local managers. The topics which they will discuss can be procured by addressing the following officers of the Department of Agriculture:

HON. N. B. CRITCHFIELD, Secretary of Agriculture.

HON. A. L. MARTIN, Deputy Secretary and Director of Institutes.

JAMES FOUST, Dairy and Food Commissioner.

PROF. H. A. SURFACE, Economic Zoologist.

DR. C. J. MARSHALL, State Veterinarian.

AGRICULTURAL SOCIETIES

It may be noted, that the County Fairs, in so far as reports have been received, have generally had a successful year, with increased attendance, added membership, applied for and received increased funds from the State; also larger premiums paid for agricultural products, and an increase in premiums offered for the coming year.

In the matter of expert judges, practically all the societies engage no other. Games of chance and gambling have been eliminated and the midway exhibition, where shows of doubtful propriety have been in evidence, are rapidly disappearing and in their stead we find high class arts exhibits, models of improved machinery, household utensils and agricultural demonstrations. Not only are the larger fairs demonstrating the best agricultural methods and practices, but there has been organized within the last few years a number of societies that, in a local way, are accomplishing much for their communities in the branch of animal industry; that is breeding of better horses, sheep and swine. Among such societies could be named, without reflecting upon the good accomplished by others, are the Pen-Mar County Agricultural Association, Warren County Farmers' and Breeders' Association and Hogestown Horse and Cattle Show. These associations are quite local in their character and give great encouragement to the average farmer in exhibiting his stock and developing in the various farm communities a rivalry in the breed of thoroughbred stock of all kinds.

The attendance for 1913 was 1,776,600, as compared with previous year, 1,568,500, shows an increase of 208,100. Membership for 1914 is 16,069, compared with last year, 15,345, shows an increase of 724; amount received from State fund, \$45,833.62, as against \$33,563.22, shows an increase of \$12,270.40; amount paid in premiums, 1913, \$157,961.77, compared with \$134,377.74 in 1912, shows an increase of \$23,584.03; amount offered in premiums, 1914, \$192,099.00, as compared with \$155,250.00 in 1913, shows an increase of \$36,849.00.

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exhibitions for 1914, Etc.

County	Corporate Name of Society	Name and Address of President	Name and Address of Secretary
Adams	State Horticultural Association of Pennsylvania	Chester J. Tyson, Floradale,	J. A. Runk, Huntingdon
Adams	Fruit Growers Association of Adams County	Robt. L. Eldon, Aspers	Edwin C. Tyson, Floradale
Allegheny	Biglerville Agricultural, Hort. and Poultry Association	E. P. Gartretson, Biglerville	O. C. Itice, Biglerville
Armstrong	Allegheny County Agricultural Association	J. M. Patterson, Imperial	C. C. Cochran, Dayton
Armstrong	Dayton Agricultural and Mechanical Association	A. K. Good, Dayton	C. J. Dickie, Vandergrift
Beaver	Kiskiminetus Valley Agricultural and Driving Association	L. Todd Owens, Apollo	M. J. Patterson, Beaver
Bedford	Beaver County Agricultural Association	P. E. Kohler, Monaca	J. Roy Cessna, Bedford
Bedford	Bedford County Agricultural Association	Dr. S. F. Statler, Bedford	George W. Oster, Osterburg
Berks	Osterburg Grange Picnic Association	Ross Slomaker, St. Clairsville	G. C. Borden, Kutztown
Berks	Kutztown Fair Association	Chas. D. Herman, Kutztown	D. J. McDermott, Reading
Blair	Agricultural and Hort. Association of Berks County	James P. Hennessy, Reading	H. S. Wertz, Duncansville
Blair	Blair County Grange Fair Association	Dr. W. Frank Beck, Altoona	G. G. Johnston, Towanda
Bradford	Bradford County Agricultural Society	Ben Kuykendall, Towanda	W. S. Montgomery, Troy
Bradford	Troy Agricultural Society	J. W. Pomeroy, Troy	G. M. Lyon, Wyalusing
Bradford	Wyalusing Fair Association	S. M. Wells, Wyalusing	I. Y. Barringer, Perkasio
Bucks	Bucks County Agricultural Society	W. E. Saracool, Benjamin	Elmer D. Haring, Quakertown
Bucks	Farmers' Picnic and Exhibition	Harry S. Johnson, Quakertown	W. E. Purvis, Butler
Butler	Butler Driving Park and Fair Association	G. A. Schaffner, Butler	A. M. Eck, Carrolltown
Cambria	Cambria County Agricultural Association	Chas. Yaeckler, Patton	Harold Seger, Emporium
Cameron	Cameron County Agricultural Association	F. X. Blumle, Emporium	J. Albert Durling, Leighton
Carbon	Carbon County Industrial Society	O. F. Acker, Leighton	Leonard Rhone, Centre Hall
Centre	Patrons of Husbandry Encampment and Fair Association	A. F. Wheeler, Oxford	Thos. F. Grier, Oxford
Chester	Oxford Agricultural Association	J. H. Darlington, West Chester	Fred De Rose Reid, West Chester
Chester	Chester County Agricultural Society	B. W. Thompson, Clarion	B. H. Frampton, Clarion
Clarion	Clarion County Fair Association	H. E. Owens, Clearfield	G. O. Goss, Curwensville
Clearfield	Clearfield County Agricultural Society	B. B. McCright, Du Bois	J. A. Slangenhoupt, Du Bois
Clearfield	Du Bois Driving Association	E. D. Hagenbuch, Bloomsburg	A. N. Yost, Bloomsburg
Columbia	Columbia Co. Agricultural, Horticultural and Mechanical Asso.	H. O. Holcomb, Conneaut Lake	Chas. T. Byers, Conneaut Lake
Crawford	Conneaut Lake Agricultural Association	James B. Pastorius, Titusville	Frank H. Flanders, Titusville
Crawford	Oil Creek Agricultural Fair Association	R. H. Thomas, Jr., Mechanicsburg	H. S. Mohler, Mechanicsburg
Cumberland	Grangers' Picnic Association	Abram Bosler, Carlisle	W. H. McCrea, Carlisle
Cumberland	Agricultural Society of Cumberland County	A. L. Erb, Middletown	F. E. Stayman, Middletown
Dauphin	Middletown Fair Association	Prof. Harry Smith, Gratz	Guy R. Klinger, Gratz
Dauphin	Gratz Agricultural and Hort. Association	Michael Wiesner, St. Marys	Geo. J. Market, St. Marys
Elk	Elk County Farmers' Agricultural and Fair Association	U. S. Fuller, Wattsburg	J. J. Rouse, Wattsburg
Erie	Wattsburg Agricultural Society	D. Warren De Rosay, Corry	Wake Morgaridge, Corry
Erie	Corry Fair and Driving Park Association		

Greene	Greene County Agricultural and Manufacturing Society	N. M. Biddle, Carmichaels	O. J. Lincoln, Carmichaels
Indiana	Indiana County Agricultural Society	M. F. Jamison, Indiana	David Blair, Indiana
Jefferson	Jefferson County Agricultural Society and Driving Park Asso.	Sam. Arthurs, Brookville	Arthur B. Stewart, Brookville
Jefferson	Punxsutawney Fair Association Land Co.,	G. W. Means, Punxsutawney	Joseph Williams, Punxsutawney
Junata	Junata County Agricultural Society	J. Holmes Book, Port Royal	James N. Groninger, Port Royal
Lackawanna	Lackawanna County Agricultural Association	Horace Seamans, Factoryville	F. L. Thompson, Shultsville
Lancaster	Lancaster County Agricultural Fair Association	P. T. Watt, Lancaster	J. F. Seldomridge, Lancaster
Lawrence	Lawrence County Agricultural Association	K. C. Haydes, Pulaski	H. H. Knox, Pulaski
Lebanon	Lebanon Valley Fair Association	W. H. Bollman, Lebanon	J. A. Bollman, Lebanon
Lebanon	Lebanon County Agricultural and Horticultural Association,	E. A. Welmer, Lebanon	S. P. Hellman, Lebanon
Lehigh	Lehigh County Agricultural Society	Dr. V. H. Wicand, Allentown	Harry B. Schall, Allentown
Muncy	Muncy Valley Farmers' Club	Theo. A. Boak, Hughesville	Edward E. Frontz, Hughesville
Lycoming	McKean County Fair Association	R. W. Hilton, Smethport	H. J. Rice, Smethport
McKean	McKean County Agricultural Society	J. M. Bentley, Mercer	Geo. H. Fowler, Stoneboro
Mercer	Mercer Central Agricultural Society	W. G. Christley, Mercer	R. M. Gilkey, Mercer
Monroe	Monroe County Agricultural Society	W. C. Hood, Stroudsburg	W. M. Burnett, Stroudsburg
Montgomery	Montgomery County Fair Association	David Haag, Pottstown	Walter E. Baker, Pottstown
Montgomery	Montgomery County Agricultural Society	Wm. K. Shimer, Nazareth	J. R. Reinhelmer, Nazareth
Northampton	Northampton County Agricultural Society	John J. Kelly, Milton	Joseph H. Johnson, Milton
Northumberland	Milton Fair and Northumberland Co. Agricultural Association	T. H. Butturt, Newport	J. C. F.
Perry	Perry County Agricultural Society	G. Engene Bown, Forksville,	David Rust, Horticultural Hall, Phila.
Philadelphia	Pennsylvania Horticultural Society	Saml. T. Bodine, Philadelphia	O. N. Molyneux, Dushore
Sullivan	Sullivan County Agricultural Society	F. A. Davies, Montrose	W. G. Comstock, Montrose
Susquehanna	Susquehanna County Agricultural Society	F. A. Osborne, Harford	O. F. Maynard, Harford
Susquehanna	Harford Agricultural Society	Isaiah Halre, Lawton,	S. C. Birchard, Lawton
Susquehanna	Lawton Agricultural Society	Geo. H. Rumsey, Westfield	J. W. Smith, Westfield
Tioga	Covanesque Valley Agricultural Society	J. F. Pitts, Elmira, N. Y.	F. H. Marvin, Mansfield
Tioga	Snythe Park Association	Wm. P. Mausor, Lewisburg	W. H. Whiting, Wellsboro
Tioga	Tioga County Pomona Grange	L. E. Foster, Hanlin Station	C. Dale Wolf, Lewisburg
Union	Union County Agricultural Society	D. B. Hitchcock, Russell	S. V. Kimberland, Burgettstown
Union	Union Agricultural Association	H. S. Grayson, Washington	B. Frank Emery, Millsboro
Washington	Sandy Plains Fair Association	W. L. Ferguson, Seelyville	R. J. Weld, Sugar Grove
Warren	Warren County Farmers' and Breeders' Association	John W. Ruth, Scottsdale	A. J. Hinrichs, Washington
Washington	Washington Fair Association	S. R. Brunges, Tunkhannock,	E. W. Gammel, Honesdale
Wayne	Wayne County Agricultural Society	John H. Wogan, York	W. F. Holtzer, Greensburg
Westmoreland	Westmoreland Fair Association	C. J. Delone, Hanover	O. D. Stark, Tunkhannock, R. D.
Wyoming	Wyoming County Fair Association	W. J. McCullough, New Freedom	Henry C. Heckert, York
York	York County Agricultural Society	M. E. Smith, Norrisville	F. W. De Lancey, Hanover
York	Hanover Agricultural Society		T. W. Brown, Fawn Grove
York	New Freedom Farmers' Improvement Association		
York	Pen Mar County Agricultural Association		

List of County and Local Agricultural Societies, with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exhibitions for 1914, Etc.—Continued.

County	Corporate Name of Society	Attendance, 1913	Race track	Membership	Amount received from State Fund	Premiums		Held 1914	Place	Date
						Paid, 1913.	Offered, 1914			
Adams	State Horticultural Assn. of Pennsylvania	300	.....	350	.....	.....	.....	.....	State College	June 17-18
Adams	Fruit Growers Assn. of Adams County	.....	.....	216	.....	.....	.....	.....	Bendersville	Dec. 16-18
Allegheny	Biglerville Agricultural, Hort. and Poultry Association	5,500	.....	102	\$502 00	\$685 00	\$1,000 00	.....	Biglerville,	Dec. 1-4
Armstrong	Allegheny County Agricultural Assn.	.....	.....	.....	.....	.....	.....	.....	Imperial	Not decided
Armstrong	Dayton Agricultural and Mechanical Assn.	25,000	$\frac{1}{2}$ mile	82	927 50	1,375 00	2,500 00	.....	Dayton	Sep. 22-25
Armstrong	Kiskiminetas Valley Agrl. and Driving Assn.	40,000	$\frac{1}{2}$ mile	197	1,000 00	3,446 96	4,000 00	.....	Apollo	Sep. 2-5
Beaver	Beaver County Agricultural Association	25,000	$\frac{1}{2}$ mile	385	1,000 00	1,198 95	4,484 00	.....	Beaver	Sep. 16-19
Bedford	Bedford County Agricultural Society	7,000	$\frac{1}{2}$ mile	233	1,000 00	1,112 95	2,500 00	.....	Bedford	Oct. 6-9
Bedford	Osterburg Grange Picnic Association	15,000	.....	.....	.....	.....	.....	.....	Osterburg	Aug. 18-21
Berks	Kutztown Fair Association	40,000	$\frac{1}{2}$ mile	510	1,000 00	1,105 48	200 00	.....	Kutztown	Aug. 25-28
Berks	Agricultural and Hort. Assn. of Berks Co.	43,000	$\frac{1}{2}$ mile	1,100	1,000 00	1,188 05	1,500 00	.....	Reading	Sep. 8-11
Blair	Blair County Grange Fair Association	30,000	$\frac{1}{2}$ mile	15	1,000 00	1,030 25	2,000 00	.....	Holidaysburg	Sep. 29-Oct. 2
Bradford	Bradford County Agricultural Society	.....	.....	.....	.....	.....	.....	.....	Towanda	Sep. 8-11
Bradford	Troy Agricultural Society	12,000	$\frac{1}{2}$ mile	3	.....	968 25	2,000 00	.....	Troy	Sep. 1-4
Bradford	Wyatusing Fair Association	5,000	.....	120	.....	310 40	1,000 00	.....	Wyatusing	Sep. 2-4
Bucks	Bucks County Agricultural Society	8,000	.....	16	825 34	861 09	.....	.....	Perkasie	Sep. 16-19
Bucks	Farmers Picnic and Exhibition	20,000	.....	81	.....	400 00	450 00	.....	Quakertown	Sep. 4-7
Butler	Butler Driving Park and Fair Association	50,000	$\frac{1}{2}$ mile	350	985 25	4,500 00	5,000 00	.....	Butler	Aug. 25-28
Cambla	Cambla County Agricultural Association	10,000	$\frac{1}{2}$ mile	378	769 25	769 25	1,000 00	.....	Carrolltown	Sep. 1-4
Cameron	Cameron County Agricultural Association	10,000	$\frac{1}{2}$ mile	10	1,000 00	.....	1,000 00	.....	Emporium	Sep. 8-11
Carbon	Carbon County Industrial Society	20,000	$\frac{1}{2}$ mile	25	1,000 00	1,000 00	1,000 00	.....	Lehighton	Sep. 29-Oct. 2
Centre	Patrons of Husbandry Encampment and Fair Association	15,000	.....	1,500	134 45	134 45	200 00	.....	Centre Hall	Sep. 12-18
Chester	Oxford Agricultural Association	7,000	$\frac{1}{2}$ mile	.....	735 00	7,500 00	7,500 00	.....	Oxford	Sep. 23-25

Chester	Chester County Agricultural Society	12,000	1 mile	180	1,000 00	2,259 80	3,000 00	West Chester	Sep. 15-18
Clarion	Clarion County Fair Association	16,000	1 mile	276	1,000 00	1,086 50	1,500 00	Clarion	Sep. 22-25
Clearfield	Clearfield County Agricultural Society	14,000	1 mile	200	1,000 00	2,004 00	2,000 00	Du Bois	No fair
Columbia	Du Bois Driving Association	35,000	1 mile	342	1,000 00	8,145 03	8,500 00	Bloomsburg	Sep. 29-Oct. 2
Crawford	Columbia County Agricultural, Horticultural and Mechanical Association	42,000	1 mile	300	1,000 00	7,500 00	7,500 00	Exposition Park	Oct. 6-9
Crawford	Oil Creek Agricultural Association	30,000	1 mile	300	1,000 00	2,450 00	5,000 00	Titusville	Aug. 31-Sep. 4
Cumberland	Grangers Picnic Association	80,000	1 mile	10	1,000 00	450 00	1,000 00	Williams Grove	Sep. 8-11
Cumberland	Agricultural Society of Cumberland Co.	18,000	1 mile	238	1,000 00	594 00	2,325 00	Carlisle	Aug. 24-29
Dauphin	Middletown Fair Association	8,000	1 mile	59	559 27	632 50	1,000 00	Middletown	Sep. 22-25
Dauphin	Gratz Agricultural and Hort. Assn.	11,000	1 mile	500	504 00	610 00	1,000 00	Gratz	Sep. 1-4
Elk	Elk County Farmers Agricultural Fair Assn.	4,000	1 mile	87	987 00	1,811 05	2,000 00	St. Marys	Sep. 15-18
Erie	Wattsburg Agricultural Society	22,000	1 mile	113	501 31	3,104 55	3,000 00	Wattsburg	Sep. 29-Oct. 3
Erie	Corry Fair and Driving Park Association	7,000	1 mile	338	1,000 00	6,921 85	8,500 00	Corry	Sep. 8-11
Greene	Greene Co. Agricultural and Mfg. Society	40,000	1 mile	250	1,000 00	1,750 00	2,500 00	Carmichaels	Sep. 1-4
Indiana	Indiana County Agricultural Society	10,000	1 mile	120	1,000 00	1,016 00	5,000 00	Indiana	Sep. 22-25
Jefferson	Jefferson County Agricultural Society and Driving Park Association	21,000	1 mile	113	1,000 00	1,016 00	1,000 00	Punxsutawney	Sep. 8-11
Jefferson	Punxsutawney Fair Assn. Land Co.	56,500	1 mile	338	1,000 00	6,921 85	8,500 00	Port Royal	No fair
Junata	Junata County Agricultural Society	52,000	1 mile	800	1,000 00	5,894 00	6,000 00	Lancaster	Sep. 29-Oct. 2
Lackawanna	Lackawanna Co. Agricultural Association	5,000	1 mile	200	1,000 00	63 00	26,000 00	Pulaski	Sep. 22-24
Lancaster	Lancaster Co. Agricultural Fair Assn.	200,000	1 mile	897	1,000 00	1,060 75	1,000 00	Lebanon	Aug. 18-21
Lawrence	Lawrence County Agricultural Association	18,000	1 mile	145	1,000 00	1,000 00	1,500 00	Lebanon	Nov. 13-14
Lebanon	Lebanon Valley Fair Association	5,000	1 mile	100	1,000 00	2,400 00	4,000 00	Allentown	Sep. 23-Oct. 2
Lebanon	Lebanon County Agri. and Hort. Assn.	25,000	1 mile	360	1,000 00	1,800 00	3,800 00	Smithport	Not decided
Lehigh	Lehigh County Agricultural Society	25,000	1 mile	15	857 05	857 05	1,000 00	Stoneboro	Sep. 8-11
Lycum	Muncy Valley Farmers Club	18,000	1 mile	15	857 05	857 05	1,000 00	Mercer	Sep. 15-17
McKean	McKean County Fair Association	5,000	1 mile	18	300 00	6,500 00	7,000 00	Stroudsburg	Sep. 7-11
Monroe	Mercer County Agricultural Society	25,000	1 mile	32	1,000 00	1,566 70	3,000 00	Pottstown	Sep. 1-4
Mercer	Mercer Central Agricultural Society	50,000	1 mile	32	1,000 00	1,566 70	3,000 00	Nazareth	Sep. 15-18
Montgomery	Montgomery County Fair Association	30,000	1 mile	400	1,000 00	1,068 93	1,500 00	Milton	Sep. 29-Oct 2
Montgomery	Northampton County Agricultural Society	16,000	1 mile	870	1,000 00	2,000 00	2,760 00	Newport	Oct. 13-16
Northumberland	Milton Fair and Northumberland County Agricultural Association	4,000	1 mile	62	472 05	472 55	800 00	Hert. Hall Phila.	Nov. 3-6
Perry	Perry County Agricultural Society	5,000	1 mile	73	872 90	872 90	1,000 00	Forksville	Sep. 29-Oct. 1
Philadelphia	Sullivan County Agricultural Society	4,500	1 mile	200	487 25	510 00	1,465 00	Montrose	Sep. 15-17
Sullivan	Susquehanna County Agricultural Society	2,000	1 mile	41	1,000 00	287 50	350 00	Harford	Sep. 8-10
Susquehanna	Susquehanna County Agricultural Society	12,000	1 mile	40	1,000 00	1,475 00	2,500 00	Lawton	Sep. 2-3
Susquehanna	Cowanesque Valley Agricultural Society	55,000	1 mile	50	1,000 00	2,368 00	2,500 00	Westfield	Sep. 8-11
Tioga	Smythe Park Association	40,000	1 mile	202	1,000 00	1,293 00	1,500 00	Mansfield	Sep. 15-18
Tioga	Tioga County Pomona Grange	33,000	1 mile	2,000	700 00	2,738 00	3,000 00	Lewisburg	Sep. 22-25
Union	Union County Agricultural Society	6,000	1 mile	15	1,000 00	4,675 45	7,000 00	Burgessstown	Sep. 29-Oct. 1
Washington	Union Agricultural Association	29,000	1 mile	15	1,000 00	1,042 70	3,000 00	Millboro	Aug. 4-6
Washington	Sandy Plains Fair Association	16,000	1 mile	17	1,000 00	1,174 41	2,000 00	Arden	No fair
Warren	Warren Co. Farmers' and Breeders' Assn.	10,000	1 mile	188	1,000 00	1,115 00	1,115 00	Honesdale	Sep. 1-4
Washington	Washington Fair Association	16,000	1 mile	17	1,000 00	1,174 41	2,000 00	Youngwood	Oct. 5-8
Wayne	Wayne County Agricultural Association	10,000	1 mile	188	1,000 00	1,115 00	1,115 00	Tunkhannock	Sep. 8-12
Westmoreland	Westmoreland Fair Association	10,000	1 mile	188	1,000 00	1,115 00	1,115 00	Tunkhannock	Sep. 15-18
Wyoming	Wyoming County Fair Association	10,000	1 mile	188	1,000 00	1,115 00	1,115 00	Tunkhannock	Sep. 15-18

List of County and Local Agricultural Societies with Names and Addresses of Presidents and Secretaries and Dates for Holding Fall Exhibitions for 1914, etc.—Continued.

County	Corporate Name of Society	Attendance, 1913	Place track	Membership	Amount received from State fund	Premiums		Held 1914
						Paid, 1913	Offered, 1914	
York	York County Agricultural Society	192,000	1 mile	228	.....	4,434 75	5,000 00	York
York	Hanover Agricultural Society	25,000	1 mile	.....	.....	.....	.....	Hanover
York	New Freedom Farmers' Improvement Association	10,000	.....	.....	394 57	394 57	500 00	New Freedom
York	Pen Mar, County Agricultural Assn.	15,000	.....	50	390 00	475 00	650 00	Fawn Grove
	Total	1,776,600	.....	16,069	\$45,833 62	\$157,961 77	\$192,099 00	.....

Very respectfully,

A. L.MARTIN,

Director of Farmers' Institutes.

REPORT OF THE DAIRY AND FOOD BUREAU

Harrisburg, Penn'a., *December 31, 1914.*

Honorable N. B. Critchfield, *Secretary of Agriculture:*

Dear Sir: I have the honor to submit herewith a preliminary report of the Dairy and Food Bureau, of the Department of Agriculture, for the year ending December 31, 1914. It covers the operations for the year and contains some details that may be useful for public information.

PRELIMINARY REPORT OF THE DAIRY AND FOOD COMMISSIONER

INTRODUCTORY REMARKS

On the following pages is presented a general summary of the activities of the Dairy and Food Bureau of the Pennsylvania Department of Agriculture, for the year ending 1914.

The duties of the Dairy and Food Commissioner are primarily those of enforcing the various laws committed to him for that purpose.

These laws are the following enactments:

Act relating to Adulteration or Coloring of Milk and Cream, June 10, 1897.

Cheese Act of June 23, 1897.

Vinegar Act of June 18, 1897, as amended by Act of May 21, 1901.

Oleomargarine Act of May 29, 1901, as amended by Act of June 5, 1913.

Renovated or Process Butter Act of July 10, 1901.

Fresh Meat, Poultry, Game and Fish Act of March 28, 1905.

Fruit Syrup Act of April 26, 1905.

Lard Act of March 11, 1909.

Fresh Eggs Act of March 11, 1909, as amended by Act of April 11, 1913.

Non-Alcoholic Drinks Act of March 11, 1909.

Ice Cream Act of March 24, 1909.

Pure Food Act of May 13, 1909.

Sausage Act of April 6, 1911.

Milk and Cream Act of June 8, 1911.

Cold Storage Act of May 16, 1913, as amended by Act of July 7, 1913.

LIMITS OF THE POWERS OF THE DAIRY AND FOOD COMMISSIONER

While the responsibility imposed by these laws upon the Dairy and Food Commissioner are large, his powers are far more limited than many citizens suppose to be the fact. Like other executive officials, the commissioner is limited in his powers and in the nature of his duties by the letter of the law. He has only very minor regulatory powers under the Constitution of the State, as interpreted by the Supreme Court. This is true even in those cases in which the law itself appears to grant him regulatory powers. Consequently, he can not, for the purpose of securing the special objects of the law, go beyond the specific warrant of its provisions, and is commonly limited by its prescriptions as to the mode also in which the respective laws are to be enforced. These statements recognize the American plan of Government, which should be known by every intelligent citizen. It is, however, here set forth because of the fact that many correspondents of the Bureau fail to understand that such limitations exist, and permit themselves to criticise it for failing to adopt methods which, to them, seem useful for accomplishing the objects of these laws. Several of these matters of criticism are deserving of special mention because, of the frequency with which they are presented and because, also, of their importance upon other considerations.

"Why," it is asked, "does not the Dairy and Food Commissioner adopt a constructive policy, that is, a policy of aiding by its investigations in the solution of the sanitary and related problems which confront the manufacturers, producers, and distributors of foods in consequence of the enactment of the food laws?" The answer is simple. However desirable the adoption of such a policy on the part of the State might be—and the desirability affords much ground for debate—nothing is found in the laws establishing the Bureau as a part of the public service, in those committed to it for enforcement, or in the various appropriation acts providing for its maintenance, affording any warrant for the provision by it for such service, or for the expenditure of public money thereon.

Again it is asked, "Why do you not tell us what labels we may use without exposing ourselves to the charge of misbranding?" The answer in this case also is simple. The law as it stands does not empower the Commissioner to prescribe labels. He can only say, "You may use any label which is not in violation of the law." Nor can he, with justice to the public welfare, approve, in the absence of official knowledge of the nature of the wares to be labeled, any label proposed by the maker. It seems hard for many to understand that the Commissioner is not the final judge in such matters, but the Court.

The general requirements of the Food Laws may be briefly stated:

Foods must be sold for what they are.

They must not contain any injurious materials.

They must be sound.

They must be sanitary.

The purposes of these requirements are two-fold: The protection of public health, and the prevention of fraud.

There is far more probability, in the present development of food production and food law enforcement, that foods may be unsanitary as the result of the conditions of raw materials, manufacturing processes or modes of handling than that they may be made deleterious to health by the addition of injurious ingredients. In making this statement, the great effort at large expense is not overlooked which many up-to-date producers and distributors have made with the object of securing for their products the highest sanitary condition. The point is that, with the sole exception of the Cold Storage Act, there is no legal warrant for any inspection by the Dairy and Food Commissioner of the conditions under which foods are produced, manufactured, distributed, retailed, delivered, or served; much less any warrant for control against unsanitary conditions during these stages by which the food is brought to the consumer.

In many of the American States there has been a progressive movement toward the placing upon the several State Governments of the duty of supervision for the purpose of securing sanitary safe-guards in the business of food making and food selling and serving. In Pennsylvania, Section 6 of the General Food Law of 1905 is the only portion of our body of food laws, other than the Cold Storage Act, that refers to sanitary conditions of producing and handling; and its terms are such as practically limit the proof of unsanitary surrounding methods of raw materials to the facts that can be established from examination of the finished products, a kind of evidence that is little suited to the purpose. Even when the fact of unsanitary condition of the product is established the Courts may punish the seller or the maker, if he can be reached, but there is no legal method by which the public can be protected against the bad goods themselves. They can not be legally seized and destroyed by any State official. The sole exception to this statement, and only a possible exception, is found in the requirement that bad eggs shall be denatured by the addition of kerosene so that they may no longer be salable for food purposes.

These statements concerning the foregoing questions about the Pennsylvania food laws, are made to correct widespread misunderstanding concerning the duties they impose and the powers they grant to the Dairy and Food Commissioner.

POLICIES OF THE BUREAU

The chief policy of the Bureau is to secure the objects of the law in the manner most suitable to protect the public health and prevent fraud, so far as the legally established methods make it possible. To this end the selection and organization of the personnel of the Bureau and the direction of its current activities are shaped. The laws having fully warranted the facts of food conditions, are from time to time brought carefully to the notice of the citizens through the courtesy of the press and by the distribution of monthly bulletins to

a large mailing list. The co-operation of organizations of producers and distributors is encouraged. These methods are supplemented by resorting to prosecution of all violators of the laws, as the laws themselves clearly indicate to be the legislative intent. Since punishment is not, however, the principal aim, prosecutions are not multiplied against individual violators of the law, unless they, by continuing their offence, make it necessary repeatedly to hale them before the Courts. Neither is it the object of the Bureau to collect revenues. We do not regard the fines imposed primarily as a source of public revenues, but hold that they should be regarded as a salutary means of securing obedience to the law. If the promise and conduct of the violator gives warrant for belief that the abuse shall stop, nominal fines will serve. The Commissioner does, however, hold that where the promises and conduct do not give evidence of an attitude of obedience to the law, that merely nominal fines, upon conviction, may weaken instead of strengthen the executive in his endeavor to secure the objects of these laws.

ORGANIZATION

While other office publications set forth fully the staff organization and personnel of the Bureau, it is believed that some comment upon the organization of the service may be valuable in this connection. The Commissioner is represented in the various parts of the State by a corps of carefully selected special agents, to each of whom is usually committed the performance of certain duties for a specified district; though, where necessary for special purposes, agents are transferred for special service to districts other than that to which they are assigned for regular service. Since the character of duties called for by the several acts are similar in nature, it does not seem necessary to allot more limited and highly specialized duties to any of these agents, with the sole exception that a single agent is employed to make the required examinations of the books of cold storage warehouses. The district agents have the duties of visiting the stores and other food-selling and food-making establishments within their districts, of securing by purchase samples of foods on sale, of sending them, under sealed cover, to the proper technical experts for examinations, and, in cases where the Commissioner so directs, of acting for him either as the public prosecutor in cases where there is evidence of violation of the law, or in cases where special complaints of citizens call for certain examinations.

TECHNICAL EXPERTS

The Commissioner is dependent upon technical experts for the discovery of such conditions in the food samples purchased as serve to indicate that they have been sold in violation of the law. Be-

cause of the nature of the examinations required, these experts are usually chemists. They must not only know how to make the necessary examinations, but they must know what examinations are required for the great varieties of foods on sale, and they must also be able clearly to interpret the results of such examinations. They must understand the meanings of food names, must know the processes by which the several kinds of foods are commonly prepared, and they must be able in the presentation of testimony to court and jury, if they are to be highly useful in the enforcement of these laws. The policy of the Bureau has been to enlist the aid of chemists who have had years of experience, and to continue in its employment those who have proven efficient in these several qualities. In order that the cost of such high class service might not be too great for the performance of a large volume of examinations, the Bureau has secured the services of the heads of commercial and institutional laboratories located in different sections of the State. This policy secures the most prompt delivery of perishable samples for examination, and the presentation of testimony in the courts with the minimum of traveling expense. In order to protect the public interest, the contract with these experts prohibits their undertaking any private service in matters relating to food production, manufacture or sale. The service performed is paid for not by salary, but by fee fixed by schedule and rated according to the time and cost of the examination involved. We believe that by the method above described, Pennsylvania has secured expert service which, for quality and economy, is surpassed by no other state in the Union.

The Bureau employs an experienced bacteriologist for certain special service.

LAW OFFICERS

Owing to the highly specific character of the cases arising under the food laws, it is often necessary for the service to employ in the various portions of the State special counsel for the conduct of prosecutions arising under the several food acts. For the same reason, a general counsel is employed to advise the Commissioner upon legal points, and also to aid in the prosecution of cases of special difficulty or importance. These special counsel are employed not usually by salary, but on the terms usually governing the private employ of attorneys.

One of the problems always arising with a decentralized working force, is to secure the co-operation of the force so that it shall work uniformly and harmoniously in the various districts. To secure this unification of service, the special agents are brought together from time to time for the discussion of the details of their duties, and are required to make frequent periodic reports of their activities of the Commissioner, so that he may instruct and guide them therein. The technical experts are organized as a Board of Chemists, which meets periodically to consult upon technical matters pertaining to their duties so that their service also may be unified.

ACTIVITIES OF THE BUREAU DURING 1914

The detailed statements concerning the activities of the several special agents, the examination of samples, the findings of adulteration, and legal proceedings instituted during 1914 are given in the appendix to this report; but summaries of these facts are presented in this connection.

SAMPLES EXAMINED AND FOUND ADULTERATED

The number of samples collected by the special agents during the year was 4811, which, together with 16 samples received from the City Board of Health of Philadelphia, which were mailed to the technical experts for examination, makes a total of 4827 samples submitted.

These samples are classified in the list given below. The number of samples examined belonging in the respective classes, together with the number found to have been sold in violation of the law, are set forth.

Class Name.	No. examined.	No. passed.	No. found illegal.
Butter,	141	141	.....
Fish,	11	6	5
Cream,	363	336	27
Milk,	2,155	1,931	224
Oleomargarine,	47	23	24
Renovated butter,	1	.....	1
Eggs,	163	115	48
Cold storage products,	96	12	84
Fresh meat,	15	1	14
Fruit syrup,	15	6	9
Ice cream,	271	184	87
Lard,	10	4	6
Non-alcoholic drinks,	369	242	127
Sausage,	117	109	8
Vinegar,	63	.....	66
Other foods,	990	809	181
	4,827	3,909	911

The figures given in the foregoing columns are not exactly comparable. Those given in the third column represent not merely the subjects of examination during the year 1914, but those in which cases presented to the courts upon the chemist's report of adulteration, misbranding, etc., and found to have been sold or exposed for sale or otherwise in violation of the law. Some of these samples were purchased prior to 1914, and correspondingly some of the samples purchase in 1914 and reported by the chemists as having been sold in violation of the law, have not yet been passed upon by the Courts. It ought further to be noted that the list in the second column includes 99 cases in which the retail vendors were protected by the guarantee of manufacturers or jobbers resident beyond

the jurisdiction of the Commonwealth, and includes no cases which were the subject of adverse reports by the chemists, but in which the Courts failed to find a verdict of guilty.

If the technical reports were made to correspond precisely with the numbers of samples collected during the year, there is no doubt that the proportion of adulterated or otherwise illegal cases belonging to the several classes of food in the above table, would be somewhat altered. The figures given will serve, however, in a general way, to indicate the general proportion which adulterated samples bore to the total of those selected by the special agents. It is, of course, readily understood that the degree of representation by purchased samples out of the total number of brands of food supplies on sale in the State, is not uniform throughout these classes. Thus, in taking samples of milk the sampling agents take samples from every milk dealer in the districts visited, but not every case of eggs on sale in the State is sampled, nor every lot of fresh meat or groceries. In a very large proportion of the cases of samples purchased, there is some special peculiarity of label, some new manufacture or some question raised by purchasers or competitors that leads to the selection of materials for examination; whereas goods that have time and again been examined and found free from adulteration under the law, are rarely included in the samples selected.

The condition of the several classes of food supplies examined will be discussed with somewhat detail in later paragraphs of this report.

PROSECUTIONS ORDERED IN 1914

Number of prosecutions ordered for the year 1914 is stated in detail in Table No. 3 of the appendix. The following summary states the number ordered in the different months of the year past, and also the kinds and number of the various classes of foods involved.

NUMBER ORDERED DURING EACH MONTH:		NUMBER ORDERED UNDER EACH LAW:	
January,	64	Cream and milk,	285
February,	22	Pure food,	223
March,	80	Non-alcoholic drinks,	152
April,	152	Cold storage,	63
May,	92	Ice cream,	59
June,	75	Eggs,	51
July,	66	Oleomargarine,	33
August,	86	Vinegar,	26
September,	74	Sausage,	25
October,	41	Fruit syrup,	7
November,	106	Lard,	4
December,	79	Cheese,	3
		Renovated butter,	1
Total,	937	Total,	937

THE MONTHLY BULLETIN

This Bureau issues in periodical form a monthly bulletin giving a statement of the list of licenses issued by the Bureau during the month, a list of the analyses for the same period, and tabulated statements of prosecutions terminated for violations of food laws. These formal statements are accompanied by editorial and other matter informing the public upon the products, legal control, sanitary conditions and uses of foods. This publication is issued to a list of 14,000 food manufacturers, dealers, and other citizens, and is made the vehicle for legal announcements as they are made. The copies of the bulletin issued during 1914 contained 843 pages, of which 203 consisted of matter other than official service announcements.

COLD STORAGE CONDITIONS IN 1914

In my annual report for 1913, reference was made to the difficulties found in making consistent interpretations of the several provisions of the Cold Storage Act of May 16, 1913. Several modifications of previous issued regulations were set forth during the current year. The requirements of the law were better understood and the difficulties of its enforcement were greatly diminished. There remained, nevertheless, many difficulties. The number of licenses issued for 1913 was 87. Two new warehouses took out licenses during the present year, making the total number of license applications to date, 89. Of these licenses, five were cancelled by request of the owners a short time after they were issued, and 12 more firms have failed to renew licenses for the period beginning August 14, 1914. The total number of warehouses now under license is, therefore, 72. Most of the warehouses that have withdrawn from the storage of the foods enumerated in the Cold Storage Act have done so because they concluded that, under existing conditions, the business was no longer profitable. Most of these withdrawals were in the case of small plants located in small communities in various parts of the State.

As previously stated, the number of cases successfully prosecuted during 1914 for violations of the Cold Storage Act of 1913 was 83. One of these was for failure to take out the license required; 64 of the cases were for failure to mark cold storage products; two for the removal of cold storage marks; one for re-entry into storage, without official authorization, of food previously cold-stored; two for storage of food beyond the legal time limit; one for selling as food cold storage beef which had been stored beyond the limit, and the remainder, 12, for selling cold storage food as "fresh." All cold storage warehouses have been periodically visited by the agents of the respective districts and are reported to have been kept in satisfactory, sanitary condition and in satisfactory state of equipment for the conduct of the cold storage business.

A question of interest is, "What have been the effects of the Cold Storage Act upon the cold storage business in Pennsylvania?" The Bureau is in possession of no exact knowledge concerning the amounts of the several classes of cold storage foods held in storage previous to the passage of the Act of 1913. It is not known how far changes may have been made in the storage business in anticipation of the enforcement of the law, which was under discussion for some months prior to its enactment in May, 1913, though not going into effect until August of that year. The figures obtained from the quarterly reports of the cold storage warehouses have been compiled for the dates given in the following table. The pressure of work upon the office force during the past fall made it impracticable to summarize the figures obtained from the reports of October 1, 1914. The lack of parallel statements for the same seasons of the two calendar years, makes it impossible to make an exact comparison. The figures shown in the table do not point at all clearly to any pronounced change in the volume of foods placed in cold storage since this law went into force.

It has been clear that, in the present lack of entirely certain means of distinguishing cold storage foods from those which have been held without refrigeration for a period of 30 days or more, the keeping track of goods that have been stored in Pennsylvania cold storage warehouses is not sufficient fully to protect the public from the sale of cold storage goods as fresh. It is doubtful whether the situation can be made entirely satisfactory so long as surrounding states lack cold storage legislation and effective governmental control against the abuses which these laws are devised to stop.

The volume of cold storage business conducted by the cold storage warehouses of the State is indicated in a general way by the following statement of the several cold storage foods held at periodic dates through that year.

QUANTITIES OF FOODS IN PENNSYLVANIA COLD STORAGE WARE-
HOUSES

Foods.	Units of quantity.	October 1, 1913.	April 1, 1914.	June 31, 1914.	December 31, 1914.
Meats:					
Whole carcasses:					
Beef,	Lbs.	33,325	32,256	17,591	382,860
Veal,	Lbs.	11,222	18,262	*2,948	50,080
Lamb and mutton,	Lbs.	142,596	40,793	28,021	474,175
Hogs,	Lbs.	1,275	4,936	†2,674	127,549
Parts of carcasses, classified:					
Beef,	Lbs.	376,136	501,607	469,131	859,904
Veal,	Lbs.	11,343	16,759.5	20,160	34,320
Lamb and mutton,	Lbs.	30,285	106,830	64,215	93,028
Hogs,	Lbs.	576,317	1,358,009	1,052,041	1,020,435
Parts of carcasses, not classified,	Lbs.	45,655	186,225	†30,709	.....
Game, pounds,	Lbs.	17,477	2,093	1,369	14,445
Game, packages,	No.	.....	.....	72	.....
Fish, pounds,	Lbs.	3,341,487	1,304,418	1,591,843	3,684,265
Fish, packages,	No.	.....	.....	5,983	.....
Domestic poultry, pounds,	Lbs.	743,772	3,253,475	2,054,435	4,406,218
Domestic poultry, packages,	No.	.....	.....	736	.....
Eggs:					
In shell,	Doz.	10,664,861	111,563	14,638,816	3,106,969
Broken, in bulk,	Lbs.	239,821	74,633.5	465,889	504,405
Broken, in packages,	No.	.....	.....	5,983	.....
Butter, in pounds,	Lbs.	10,445,790	952,645	5,070,923	3,212,860
Butter, in packages,	No.	.....	.....	1,751	.....

*Besides 1,751½ packages. †Besides 27 packages. ‡Besides 188 packages.

MILK

As in past years, the samples of cream and milk examined have constituted more than half the total number of food samples examined. Out of several thousand samples, the number of adulterated samples, or samples falling below the minimum standard fixed by the laws, was approximately 10 per cent. Of these, the departures from normal were sufficient to show that one-third had been watered and one-third had been skimmed; while, in the remaining cases, the evidence of watering or skimming was not sufficient to establish the facts of such treatment, although the samples contained less than the standard amounts of fat or of milk solids. The average condition of richness of commercial milks in the State continues to show an improvements over that existing before the enactment of the present standard.

ICE CREAM

Of the 271 samples examined, about one-third fell below the required amount of milk fat, which was practically the only kind of adulteration detected. In view of the exceedingly low standard fixed for this class of foods, the large proportion of adulteration found is especially deserving of condemnation. It may be added that the deficiencies reported appeared after a liberal allowance for error in sampling made because of the special difficulties of this operation in preparing ice cream for analysis.

BUTTER

It is particularly gratifying that of more than 100 samples examined as to composition, not one was found to depart sufficiently from the normal composition to warrant its being condemned as adulterated. The examinations made for the enforcement of the laws against adulteration does not, of course, involve any examinations as to the grade of excellence of the samples purchased.

RENOVATED BUTTER

There is only a very small volume of this commodity now on sale on the Pennsylvania markets, and the only prosecution under the Renovated Butter Act was for selling without having first obtained the required license.

OLEOMARGARINE

The condition existing since the passing of the amendment of 1913, more definitely fixing the color limit for this commodity, continues to be excellent. The special agents have continued diligently to observe the color of the various brands of oleomargarine on sale in the Commonwealth, and have found only a small number concerning which there was sufficient question to justify the purchase of samples for examination. The number of condemnations was 24; nine for selling without a license; one for selling without the proper stamp upon the package or wrapper, and 14 only because of their being colored in the imitation of yellow butter. There has never been a time since the first enactment of oleomargarine legislation

back in the '80's when oleomargarine was so universally sold for what it is, has been so cheap relative to butter, and its sale so great. In fact, the public use of this material is rapidly on the increase.

SAUSAGE

Out of the 117 samples purchased for examination, only eight were condemned; three because of decomposition which rendered them unfit for use as food; one because of the addition of sulphur dioxide; one because of the addition of excessive amounts of water, although no starchy binder was employed. The conditions as to adulteration of this class of foods continue to be excellent, as compared with the state of affairs existing prior to the passage of the Sausage Law.

LARD

Of lard, only a small number of samples were examined during the year, these having been selected because of some suspicion as to their nature. Of these, four were found to contain some cottonseed oil product, and one was declared to be an imitation.

EGGS

163 samples were examined to ascertain their fitness for human consumption. In six cases, of eggs found in bakeries where they had been or were about to be used for making cakes, the eggs were found decomposed and unfit for human food. These examinations were additional to those above reported in the paragraph dealing with the enforcement of the Cold Storage Act.

VINEGAR

The product sold as cider vinegar still continues to show a large proportion of adulteration. The principal adulteration continues to be the addition of water to cider vinegar, and use of some sugar containing material other than apple solids. The instances of adulteration found include several in which syrup vinegar was made from substances other than syrup or molasses. The acetic acid used in these adulterated articles was obtained chiefly from distilled vinegar. As elsewhere stated, 66 convictions were obtained during the year for offenses relating to this commodity.

FRUIT SYRUPS

Fruit syrups exhibited, in nearly all instances of adulteration of this product, coal tar dye, giving it a deceptive color; in one case only was the use of artificial flavoring, instead of the natural flavor reported.

NON-ALCOHOLIC DRINKS

Although the proportion of adulteration now found as compared with that which existed before the passage of the Non-Alcoholic Drinks Law, is greatly reduced, it is still disappointingly great. The kinds of adulteration remain the same as in the recent past. Forty-

six cases of the use of saccharin; 36 of the use of artificial and deceptive colors or dyes; and 19 of artificial flavoring were found; and two only in which alcohol was found in large quantities than should be expected in beverages of this class. Misbranding continues to be altogether too common, and 50 cases were found in which misbranding was satisfactorily established. The conditions with respect to this class of goods are not so good as they were a year ago when the examination of a large number of samples showed the almost entire elimination of saccharin as an ingredient.

SAMPLES EXAMINED UNDER THE GENERAL FOOD LAW

Of the large number of materials examined to determine their conformity to this general act, the variety is too great for detailed statement in this connection. The kinds of adulteration will, however, receive special mention here. Condemnations of food because of their being decomposed or generally rendered unfit for human consumption were unusually numerous, there having been 51 convictions for offenses of this kind, and the substances concerned include a great variety: almond paste, almonds, beef, cheese, chestnuts, chicken, cocoa, corn meal, English walnuts, figs, fish, ham, lima beans, mackerel, milk, oranges, pigs' feet, pork chops, rabbits and other meats, potatoes, sausage, shad, tomato catsup, turkey and water melon. The use of chemical preservatives has been very much reduced, but in the cases where the material has been given a tolerance under the law, there were a number of convictions secured because of failure properly to announce the presence of these preservative materials, or because of the use of an excess beyond the limit of tolerance. In 19 such cases, dried fruits containing sulphur dioxide were sold without declaration of its presence; five of apricots, one of fig and peach, and 19 of prunes and raisins; and there were 12 similar cases relating to the presence in excessive amount of sodium benzoate; catsup (3); cherries, cocktail and maraschino, (3), and sweet pickles (1), and Worcestershire sauce (2). No cases were reported in which saccharin was found in this class of food materials. The deceptive use of coal tar dye in foods, which normally contain eggs, was reported in 13 cases; six of cakes and seven of macaroni and noodles.

OLIVE OIL

Table oils sold as olive oil still continue to show occasional instances of cottonseed oil addition. Convictions were obtained in six cases of this kind.

FLAVORING EXTRACTS

Flavoring extracts, for the most part, exhibited a good degree of conformity of composition of the product to the declaration of the label. In six cases only were convictions obtained, chiefly for misbranding, and in one instance because of the presence of coal tar dye,

CANDIES

The work of the year included examinations of a large number of candies. In very few cases resinous glaze, once so commonly used, appeared; in eight cases convictions were obtained for the addition of starchy matter where sugar should have been expected. In all, there were 35 convictions for adulteration of this kind of commodity.

FLOUR

A very large number of flours have been examined. Of bleached flours, in 24 cases convictions were for the addition of nitrous acid.

COFFEE

During many years past the examination of package coffees has shown a very good condition of freedom of these materials from foreign additions. The sale of the whole coffee bean instead of the ground material has, of course, made adulteration more difficult. Examination was made of the coffee sold at lunch counters, restaurants, etc., the examination in these cases being made upon the coffee decoction of drink, rather than upon the raw material from which it was made. There were 30 cases of adulteration established by these examinations.

TIN SALTS

The very large use of tin-coated containers for the packing and preserving of moist foods has raised a number of questions requiring the very careful consideration of health officers. While tin is much less soluble than other metals when left in contact with substances, such as common foods, it is, nevertheless, not entirely insoluble. In most cases, however, the amounts dissolved are small, and facts thus far established concerning the influence of very small amounts of tin upon human health have not been sufficient to warrant condemnation, which would have worked the practical banishment of all tin containers from use for the foods. Such a wholesale change would have greatly increased the difficulty of preserving foods, and also very greatly increased the container-cost which the consumer is obliged to pay as part of the price for the food he buys. Because of these facts, condemnations of foods as adulterated because of the presence of tin salts has been limited to those cases only in which very large amounts, relatively speaking, of these salts were found present. Two convictions were obtained during the past year because of such adulteration; one in the case of salmon and kippered herring, and one in the case of canned tomatoes.

GROCERIES

As a whole it may be said that the state of groceries continues to show an excellent freedom from adulteration and serious misbranding.

RECEIPTS AND EXPENDITURES

The last table of the appendix shows in detail the receipts from license fees and fines for the year 1914, and the amounts expended from the appropriation for the maintenance of the work of this Bureau.

To afford an idea of the growth of the Bureau's work during the term of the present Commissioner, the following table shows the number of samples analyzed, cases terminated, and the receipts from license fees and fines, which have been paid direct to the State Treasury, and on the other hand, the expenditures made under specific appropriations for the maintenance of the work of the Bureau.

Year.	Samples analyzed.	Cases terminated.	Receipts.	Expenditures.
1907,	7,400	664	\$55,732 63	\$78,455 88
1908,	8,300	300	54,580 62	69,986 20
1909,	6,200	797	86,594 15	83,700 00
1910,	5,594	667	110,802 95	79,661 65
1911,	8,200	1,029	120,993 48	83,083 15
1912,	7,204	1,049	136,125 49	81,858 55
1913,	6,846	1,025	173,789 76	75,587 12
1914,	4,827	1,010	225,910 78	73,271 41
	54,571	6,541	\$964,529 86	\$625,585 96

This table shows that the receipts for the year 1914, which are deposited with the State Treasurer for the use of the Commonwealth, were \$152,639.37 in excess of the expenditures, which are provided for by a special appropriation, and that for the entire period of eight years the total receipts were \$338,943.90, in excess of the expenditures.

It may be worth while to repeat in this connection that the cost of the service is about 12 cents for each \$1,000.00 of food purchased by the citizens of Pennsylvania, or about one cent annually for each head of population. That statements such as those given above, are not suitable to determine the value of the service or its efficiency, has so often have been said in these reports, that it is not necessary to repeat it in this connection. It is, however, entirely clear that, in Pennsylvania and in other states of the Union, the introduction of the system of pure food legislation has very greatly increased the certainty of a citizen securing that food for which he asks when he goes out to buy, and of his receiving it in a sound condition and free from injurious ingredients. It is pleasing to be able to say that the public, the courts, and the press continue to show a warm appreciation of the importance of this work, and give to it an increasing measure of cordial support.

CONCLUSION

The Commissioner desires to renew his expression of obligation to the Honorable John K. Tener, Governor of the Commonwealth, and to Honorable N. B. Critchfield, Secretary of Agriculture, for their continued support of the work of this Bureau; and also to the Attorney General's Department for constant interest and able assistance in the legal phases of the work; and especially does the Commissioner desire to recognize most cordially the loyalty, intelligence and skill of the various members of his staff, special agents, technical experts and general counsel, as well as the clerical force of the central office; for without the assistance of all, the successful work of the year could not have been accomplished.

JAMES FOUST,
Dairy and Food Commissioner.



APPENDIX



SUMMARY

The following gives a list of articles analyzed by Chemists of this Bureau during the year 1914.

Article.	Number Analyzed.
DAIRY PRODUCTS:	
Butter,	141
Cheese,	11
Cream,	363
Milk, butter,	14
Milk, condensed,	1
Milk, evaporated,	3
Milk, skimmed,	29
Milk,	2,103
	<u>2,670</u>
OLEOMARGARINE,	<u>47</u>
RENOVATED BUTTER,	<u>1</u>
EGGS, (fresh, frozen, liquid, opened and in shell),	<u>163</u>
COLD STORAGE PRODUCTS:	
Beef,	1
Beef and pork,	1
Butter,	6
Chicken,	2
Eggs,	48
Fish, butter,	3
Fish, fresh,	12
Fish, sea bass,	1
Fish, smelts,	2
Fish, trout,	1
Fish, white,	3
Food (no name given),	1
Lamb,	3
Lamb and mutton,	1
Pork,	2
Pork chops,	6
Sweet breads and flank steaks,	1
Turkey,	2
	<u>96</u>
BREAD, CAKES AND PUDDINGS:	
Bread,	1
Cake, currant,	2
Cake, jelly roll,	4
Cake, lady fingers,	1
Cake, orange,	4
Cake, plain,	2
Cake, pound,	2
Cake, sponge,	2
Cake, vanilla flavor,	1
Gelatin,	2
Jello, cherry flavor,	1
Jello, chocolate,	1
Jello, lemon,	1
Jello, (no flavor given),	1
Jello, orange flavor,	1
Jello, peach flavor,	1
Jello, raspberry flavor,	1
Jello, strawberry flavor,	2
Pudding, chocolate,	1
	<u>31</u>

SUMMARY—Continued.

Article.	Number Analyzed.
CANNED FRUITS AND VEGETABLES:	
Beans,	1
Beans, baked,	1
Beans, baked with tomato sauce,	3
Beets,	1
Cherries,	9
Cherries, Bigarreau,	3
Cherries, Cocktail,	7
Cherries, Maraschino,	24
Mincemeat,	1
Mushrooms,	7
Peas,	5
Peas, French,	1
Pie fruit (raspberry flavor),	1
Sauer Kraut,	1
Tomatoes,	3
	<hr/> 68 <hr/>
DRIED AND EVAPORATED FRUITS:	
Apples, evaporated,	1
Apricots, dried,	9
Figs, dried,	9
Peaches, dried,	14
Raisins, dried,	1
	<hr/> 34 <hr/>
CATSUP, OIL, PICKLES, SAUCES, ETC.:	
Catsup, (no name given),	25
Catsup, tomato,	95
Horseradish,	2
Oil, Olive,	10
Oil, Salad,	3
Pickles,	2
Pickles, mixed,	3
Pickles, sour,	1
Pickles, sweet,	7
Relish, table,	1
Sauce, burnt onion,	1
Sauce, Chili,	3
	<hr/> 153 <hr/>
COFFEE:	
Coffee, cups of,	186
Coffee, ground,	23
Coffee, whole,	5
"Riola" (coffee compound),	1
	<hr/> 215 <hr/>
CONFECTIONERY:	
Candied Figs,	1
Candied Pineapple,	3
Candy,	3
Candy, Banana,	1
Candy, Easter Eggs,	2
Candy, Jelly Balls,	1
Candy, Jelly Beans,	4
Candy, Jelly Eggs,	2
Candy, Mixed,	7
Candy, Molasses,	1
Candy, Molasses and Walnut,	1
Candy, Orange Cream,	1
Caramels,	1
Chocolates, assorted,	1
Chocolate Balls,	1
Chocolate Candy,	1
Chocolate Candy Babies,	5
Chocolate Coated Almonds-Dates,	3
Chocolate Coated Cream Eggs,	1
Chocolate Coated Cream Coconut Eggs,	7
Chocolate Coated Mints,	1
Chocolate Rum Balls,	1
Chocolates, Russian,	1

SUMMARY—Continued.

Article.	Number Analyzed.
CONFECTIONERY—Continued.	
Chocolate Wafers,	1
Cocoanut Bars,	2
Cocoanut Bonbons,	18
Cocoanut Candy,	2
Cocoanut Dainties,	1
Licorice Candy,	12
Licorice Candy Babies,	5
Licorice Candy Beans,	6
Licorice Cough Drops,	1
Licorice Gum Drops,	12
Licorice Jelly Candy,	2
Licorice Lozenges, (sugar coated),	1
Lime Drops,	1
Marshmallows, Chocolate,	1
Near Chocolates,	1
Orange and Lemon Candy Slices,	1
Peppermint Balls,	1
Roman Nougat,	3
Wintergreen Lozenges,	1
	122
FLAVORING EXTRACTS:	
Extract, Lemon,	11
Extract, Orange,	3
Extract, Pineapple,	1
Extract, Raspberry,	1
Extract, Root Beer,	2
Extract, Strawberry,	2
Extract, Vanilla,	2
	22
FLOUR:	
Cornmeal,	2
Flour, buckwheat,	2
Flour, wheat,	164
Kako (cake flour),	1
	169
FRUIT BUTTERS, JAMS, JELLIES AND PRESERVES:	
Butter, Apple,	1
Butter, Peanut,	5
Jam, Apple—Blackberry,	1
Jelly, Apple,	2
Jelly, Apple—Currant,	1
Jelly, Corn Syrup—Apple,	1
Jelly, Corn Syrup—Fruit,	1
Jelly, Cranberry,	1
Jelly, Glucose—Apple,	1
Preserves, Cherry,	1
Preserves, Corn Syrup—Tomato—Apple,	1
Preserves, Pineapple,	1
Preserves, Plum,	1
Preserves, Plum—Apple,	1
Preserves, Strawberry,	1
	20
FRUIT SYRUPS:	
Cherry,	3
Lemon,	4
Orange,	1
Raspberry,	3
Strawberry,	2
Vanilla,	2
	15

SUMMARY—Continued.

Article.	Number Analyzed.
HONEY AND SYRUPS:	
Honey,	1
Syrup, Breakfast,	1
Syrup, Corn,	1
Syrup, Log Cabin,	1
Syrup, Maple,	4
Syrup, Table,	3
Syrup, Vanilla,	1
	<hr/> 12 <hr/>
ICE CREAMS:	
Ice Cream, Banana,	1
Ice Cream, Bisque,	1
Ice Cream, Caramel,	3
Ice Cream, Cherry,	1
Ice Cream, Chocolate,	34
Ice Cream, Fruit,	1
Ice Cream, (no flavor given),	5
Ice Cream, Maple,	1
Ice Cream, Maple-Nut,	2
Ice Cream, Maple-Walnut,	1
Ice Cream, Peach,	5
Ice Cream, Pineapple,	1
Ice Cream, Raspberry,	1
Ice Cream, Strawberry,	19
Ice Cream, Vanilla,	195
	<hr/> 271 <hr/>
LARD,	10
	<hr/>
FISH—CANNED, DRIED AND FRESH:	
Bass,	1
Butterfish,	2
Codfish, Boneless,	1
Codfish, Dried,	2
Codfish, Fresh,	2
Codfish, Shredded,	7
Fish, Fresh,	6
Herring,	1
Herring, Kippered,	1
Herring, Pickled,	1
Mackerel,	3
Oysters, Fresh,	7
Salmon (canned),	9
Sardines,	8
	<hr/> 51 <hr/>
MEATS—CANNED AND FRESH:	
Bacon,	1
Beef, Boiled,	1
Beef, Chipped,	1
Beef, Sliced (canned),	1
Beef, Smoked,	1
Beef, Fresh,	4
Chicken, Cooked,	1
Chicken, Fresh,	1
Duck,	1
Goat, Shoulder of,	1
Hamburg Steak,	11
Ham, Minced,	1
Meat, Cooked,	2
Meat, Potted,	1
Meat, (no name given),	1
Mutton, Leg of,	1
Pork,	2
Pork and Beans,	5
Pork Kidney,	1
Tongue, Lamb's,	1
Tuberculous Meat,	1
	<hr/> 40 <hr/>

SUMMARY—Continued.

Article.	Number Analyzed.
SAUSAGE:	
Sausage, Blood,	1
Sausage, Bologna,	14
Sausage, Frankfurters,	10
Sausage, Fresh,	13
Sausage, Fresh Pork,	55
Sausage, Garlick,	1
Sausage, Half-Smoked,	2
Sausage, Polish,	1
Sausage, Vienna style,	6
Sausage, Wiener,	14
	<hr/> 117 <hr/>
NON-ALCOHOLIC DRINKS:	
Barlo,	1
Birch Beer,	19
"Cherry,"	1
Cherry Smash,	1
Clder, Champagne,	1
Ginger Ale,	6
Hop Ale,	2
Jamaica Ginger,	1
Lemonade,	3
Lemon Juice,	2
Lime Juice,	1
"Near Beer,"	2
Orangeade,	3
Orange Phosphate,	3
Pop, Birch,	3
Pop, Lemon,	5
Pop, Orange,	2
Pop, Strawberry,	17
"Port Lango,"	1
"Raspberry,"	2
Root Beer,	22
Sarsaparilla,	5
Soda, Blood Orange,	1
Soda, Cherry,	30
Soda, Cream,	12
Soda, Ginger,	2
Soda, Grape,	2
Soda, Lemon,	59
Soda, (no flavor given),	20
Soda, Orange,	28
Soda, Peach,	1
Soda, Pear,	1
Soda, Pineapple,	7
Soda, Raspberry,	27
Soda, Red,	2
Soda, Strawberry,	66
Soda, Vanilla,	5
Soft Drink (no name given),	1
Swankey,	2
	<hr/> 369 <hr/>
NUTS:	
Almonds, shelled,	2
English Walnuts,	3
Hickorynuts,	1
Nuts, mixed,	2
	<hr/> 8 <hr/>
SPICES, ETC.:	
Cinnamon, ground,	1
Cloves, ground,	1
Mustard, prepared,	2
Pepper, black, ground,	1
	<hr/> 5 <hr/>

SUMMARY—Continued.

Article.	Number Analyzed.
VINEGAR:	
Vinegar, Apple,	2
Vinegar, Brown,	2
Vinegar, Brown, Table Pickling,	2
Vinegar, Cider,	45
Vinegar, Distilled,	2
Vinegar, Fermented Syrup,	1
Vinegar, (no name given),	1
Vinegar, Pineapple,	3
Vinegar, Red,	1
Vinegar, Sugar,	1
Vinegar, Syrup and Distilled,	3
	<hr/> 63 <hr/>
MISCELLANEOUS PRODUCTS:	
Baking Powder,	1
Breakfast Food,	1
Cabbage, heads of,	1
Chicken gravy,	1
Clam juice,	1
Cocoa,	4
Codfish Tablets,	1
Cold-slaw,	1
Cranberry Sauce,	1
Dessert Powder,	1
Do-Ne-Do,	1
Glace Apricots,	3
Grapes,	1
Grape Fruit,	1
Ice Cream Cones,	1
Jack Frost Fontane,	1
Jelly Powder,	1
Jelly Quick (peach flavor),	1
"Lekvar,"	1
Lima Beans,	1
Macaroni,	2
Mapleine,	1
Noodles, Egg,	4
Postum, instant,	1
Potatoes,	2
Quinces,	1
Root Beer Tablets,	2
Salt, Table,	1
Shredded Wheat,	1
Soft Drink Tablet,	1
Spaghetti,	2
Sugar, Granulated,	3
Sugar, Maple,	1
Tumeric,	1
Waffle Batter,	1
Waffles, cooked,	1
Watermelons,	4
Whiskey,	1
	<hr/> 55 <hr/>
RECAPITULATION	
Butter,	141
Cheese,	11
Cream,	363
Milk,	2,155
Oleomargarine,	47
Renovated Butter,	1
Eggs,	163
Cold Storage Products,	96
Fresh Meat,	15
Fruit Syrup,	15
Ice Cream,	271
Lard,	10
Non-Alcoholic Drinks,	369
Sausage,	117
Vinegar,	63
Food,	990
	<hr/> 4,827 <hr/>

CASES TERMINATED

THE FOLLOWING TABLE GIVES A LIST OF ARTICLES ANALYZED BY
CHEMISTS AND FOUND TO BE IN VIOLATION OF THE FOOD LAWS,
AND THE NUMBER OF SAMPLES OF EACH PRODUCT ON WHICH
PROSECUTIONS WERE BASED AND TERMINATED

COLD STORAGE ACT, 1913, IN VIOLATION OF

Cold Storage Beef, outlawed, offered for sale,	1
Cold Storage Beef Kidneys, stored beyond legal limit,	2
Cold Storage Butter, not properly marked,	3
Cold Storage Chicken, as and for fresh chicken,	1
Cold Storage Chicken, re-entered into storage as fresh,	1
Cold Storage Eggs, as and for fresh eggs,	2
Cold Storage eggs, not properly marked,	38
Cold Storage Fish, as and for fresh fish,	3
Cold Storage Fish, not properly marked,	10
Cold Storage Halibut, not properly marked,	1
Cold Storage Lamb, as fresh lamb, and removing cold storage marks,	1
Cold Storage Livers, not properly marked,	1
Cold Storage Meats, not properly marked,	1
Cold Storage Meats, outlawed,	1
Cold Storage Mutton, as fresh mutton, and removing cold storage marks,	1
Cold Storage Mutton, not properly marked,	1
Cold Storage Ox-Tails, not properly marked,	1
Cold Storage Pork Chops, as and for fresh pork chops,	6
Cold Storage Poultry, at wholesale, not properly marked,	1
Cold Storage Sea Bass, not properly marked,	1
Cold Storage Smelts, not properly marked,	4
Cold Storage Turkey, not properly marked,	2

 83

EGG ACT, 1909, IN VIOLATION OF

Eggs, decomposed,	3
in cakes,	1
in bakery,	1
using in the preparation of cakes,	1
and unfit for food,	1
unfit for food,	13
to be used in bakery,	1
participating in the sale of,	2

 23

CASES TERMINATED—Continued.

FOOD ACT, 1909, IN VIOLATION OF

Almond Paste, containing worms; unfit for food,	1
Almonds, shelled, unfit for food,	1
wormy and moldy, unfit for food,	1
Apricots, dried, not properly marked,	3
containing sulphur dioxide,	1
Glaze, containing sulphur dioxide,	1
Beef, decomposed, unfit for food,	1
Bon Bons, containing cereals,	1
Cake, colored with coal tar dye,	2
colored and having a frosting colored with a coal tar dye,	1
Cakes, assorted, colored with a coal tar dye,	1
Cheese, wormy and decomposed, sold at auction,	1
Cherries, containing sodium benzoate; not stated on package, ..	1
Chestnuts, decomposed and wormy,	1
Chicken, decomposed,	2
unfit for food,	1
Chocolate Coated Babies, containing a resinous glaze,	1
Babies, misbranded,	1
Cocoanut Cream Eggs, adulterated,	1
Mints, adulterated,	1
Cocktail Cherries, containing undeclared sulphur dioxide,	3
Cocoa, ground, unfit for food,	1
Cocoanut Bon Bons, adulterated,	1
containing cereals,	6
containing starch as a filler,	1
Coffee, adulterated,	14
Corn Meal, containing worms, bugs and webs,	1
unfit for food,	1
Cream Chocolate Cocoanut Eggs, adulterated,	1
Cup Coffee, adulterated,	16
Drop Cakes, colored with a coal tar dye,	1
Eggs, decomposed,	1
not fresh,	2
limed, as and for fresh eggs,	2
rotten, as and for fresh eggs,	2
stale, as and for fresh eggs,	14
unfit for food,	2
at bakery,	1
in the preparation of cakes,	1
cold storage, unfit for food,	1
Egg Macaroni, containing coal tar dye,	1
Egg Noodles, containing no eggs, colored with coal tar dye,	1
artificially colored in imitation of eggs,	1
English Walnuts, unfit for food,	1
Figs, California, containing sulphur dioxide, not marked,	1
unfit for food, decayed and decomposed,	1
Fish, decomposed,	4
Flour, containing added nitrous acid,	24
Ham, decomposed,	1
Ham, Bologna, misbranded,	2
Honey, adulterated,	1
Jelly Licorice Candy, adulterated,	1

CASES TERMINATED—Continued.

Kipperd Herring, containing salts of tins,	1
Lemon Extract, misbranded,	1
containing but a trace of lemon,	1
Licorice, misbranded,	2
Licorice Babies, adulterated and misbranded,	1
imitation of,	1
misbranded,	1
Licorice Baby Candy,	1
Licorice Beans, adulterated,	2
sugar coated, imitation,	1
Licorice Candy, misbranded,	1
Licorice Cough Drops,	1
Licorice Gum Drops, adulterated,	4
adulterated and misbranded,	1
misbranded,	1
Licorice Sticks, imitation,	1
Lima Beans, wormy; unfit for food,	1
Macaroni, artificially colored,	1
Macaroni, colored with a coal tar dye in imitation of egg macaroni,	1
Macaroni, containing coal tar color,	1
Mackerel, decomposed,	3
Maraschino, containing sulphur dioxide,	1
Maraschino cherries, containing sulphur dioxide,	1
misbranded,	1
Meat, decomposed,	1
fresh, decomposed and unwholesome,	1
Meat, decomposed,	1
Meat, diseased, contaminated and unwholesome,	1
Milk, not kept free from contamination; unfit for human con- sumption,	1
Mutton, leg of, unfit for food,	1
Olive Oil, adulterated,	2
Olive Oil, containing cotton seed oil,	4
Oranges, frozen and decomposed; unfit for food,	3
Orange Cake, containing coal tar color,	1
Orange Extract, misbranded,	1
Peaches, dried, adulterated,	1
containing undeclared sulphur dioxide,	9
not properly stamped,	1
Pigs Feet, decomposed, using same in the preparation of pigs foot jelly,	1
Pineapple Flavor, misbranded,	1
Pork, tainted and unwholesome,	1
Pork chops, decomposed,	1
Potatoes, decomposed,	1
Prunes, containing undeclared sulphur dioxide,	1
Rabbits, decayed,	1
decomposed and putrid,	1
Sausage, decomposed; unfit for food,	2
Shad, decomposed; unfit for food,	1
Strawberry Extract, misbranded and containing coal tar dye,	1
Sweet Mixed Pickles, containing excess of benzoate of soda,	1

CASES TERMINATED—Continued.

Tomatoes, canned, containing salts of tin,	2
Tomato Catsup, containing excess of Benzoic Acid,	1
containing excess of sodium benzoate and made from moldy materials,	1
containing excess of benzoate of soda and made from decomposed materials,	1
Turkey, decomposed,	2
decomposed and putrid,	2
Vanilla Syrup, adulterated,	1
Watermelons, decomposed,	2
rotten,	1
unfit for food,	3
White Raisins, containing undeclared sulphur dioxide,	1
Worcestershire Sauce, containing saccharin and benzoate of soda,	2
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	226

FRUIT SYRUP ACT, 1905, IN VIOLATION OF

Lemon Syrup, containing coal tar dye,	1
Orange Syrup, containing coal tar dye,	4
Raspberry Syrup, artificially flavored,	1
containing coal tar dye,	1
Strawberry Syrup, containing coal tar dye,	2
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	9

ICE CREAM ACT, 1909, IN VIOLATION OF

Chocolate Ice Cream, low in fat,	11
Ice Cream, adulterated,	1
low in butter fat,	21
at wholesale, made from skimmed milk,	1
Strawberry Ice Cream, low in butter fat,	3
Vanilla Ice Cream, low in butter fat,	50
	<hr/>
	87

LARD ACT, 1909, IN VIOLATION OF

Lard, adulterated,	1
containing cottonseed oil,	2
containing cottonseed product,	2
imitation,	1
	<hr/>
	6

MILK ACT, 1911, IN VIOLATION OF

Cream, low in butter fat,	27
Milk, adulterated,	12
low in fat and total solids,	54
low in fat and total solids; skimmed,	66
low in fat and total solids; watered,	38
low in fat and total solids; skimmed and watered,	3
low in fat,	9

CASES TERMINATED—Continued.

low in fat; watered,	3
watered,	28
low in solids; watered,	5
low in fat and total solids; partially skimmed,	4
low in fat; partially watered,	1
skimmed, watered,	1

251

NON-ALCOHOLIC DRINK ACT, 1909, IN VIOLATION OF

Barto, containing an excess of alcohol,	1
Birch Beer, containing saccharin,	3
misbranded,	3
Birch Pop, containing saccharin,	1
Blood Orange Soda, adulterated,	1
Cherry Soda, artificially colored,	7
misbranded,	3
misbranded and adulterated,	1
misbranded and containing coal tar color,	2
Cream Soda, misbranded,	2
containing saccharin,	1
misbranded and containing coal tar dye,	1
Grape Soda, misbranded,	1
Hop Ale, containing saccharin,	1
Lemon Soda, containing saccharin,	10
Lemon Pop, containing saccharin,	2
Lemon Soda, not properly branded,	1
Lemon Syrup, containing saccharin,	1
Near Beer, misbranded,	2
Orangeade, containing coal tar dye,	1
Orange Phosphate, artificially colored,	1
misbranded,	3
Orange Soda, artificially colored,	1
misbranded and adulterated,	1
misbranded and containing coal tar dye,	1
misbranded,	4
misbranded; artificially colored and flavored,	2
misbranded and colored,	2
Orange Pop, containing saccharin,	1
Orange Soda, containing saccharin and misbranded,	2
Peach Soda, misbranded; artificially colored and flavored,	1
Pear Soda, artificially flavored in imitation of pear,	1
Pineapple Soda, containing saccharin,	2
Raspberry Soda, artificially colored,	1
artificially flavored,	1
containing saccharin,	3
containing saccharin; artificially colored and flavored,	1
misbranded,	3
misbranded and containing coal tar color,	2
Root Beer, containing saccharin,	4
Root Beer Tablets, containing saccharin,	1
Soda Water, adulterated,	2
Soft Drink, misbranded,	1

CASES TERMINATED—Continued.

Strawberry Pop, artificially flavored and colored,	5
misbranded,	6
misbranded and adulterated,	6
Strawberry Soda, artificially colored,	2
artificially flavored,	2
artificially colored and flavored,	5
containing saccharin,	10
containing saccharin and artificially colored,	1
containing saccharin and artificially flavored,	1
containing coal tar dye and misbranded,	1
imitation of,	1
Weis Beer, containing alcohol,	1

127

OLEOMARGARINE ACT, 1901, IN VIOLATION OF

Oleomargarine, without a license,	5
at wholesale, without a license,	2
serving without a license,	2
colored,	4
colored in imitation of yellow butter,	3
colored, as and for butter,	7
as and for butter; not stamped,	1

24

RENOVATED BUTTER ACT, 1901, IN VIOLATION OF

Renovated Butter, serving without a license,	1
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1

SAUSAGE ACT, 1911, IN VIOLATION OF

Sausage, containing added water,	3
Pork, containing sulphur dioxide,	1
unfit for food,	2
Fresh, unfit for food,	1
Vienna style, containing vegetable flour and added water,	1

8

VINEGAR ACT, 1901, IN VIOLATION OF

Vinegar, cider, adulterated,	35
adulterated and colored,	1
containing added water,	2
consisting largely of syrup vinegar,	1
which was distilled vinegar,	1
Vinegar distilled, as and for cider vinegar,	13
fermented syrup and caramel, as and for cider vinegar,	1
colored, for fermented syrup vinegar,	1
for white vinegar,	1
low in acidity and colored, for cider vinegar,	1
Vinegar, adulterated,	8
Vinegar, watered,	1

66

Cases terminated on the presentation of proper guarantee by the retailer from whom samples were purchased,	99
Total number of cases terminated,	1,010

RECEIPTS OF THE DAIRY AND FOOD BUREAU FOR THE
YEAR 1914

Oleomargarine License Fees,	\$195,219 05
Renovated Butter License Fees,	675 00
Cold Storage License Fees,	3,650 00
Oleomargarine Fines,	2,253 50
Renovated Butter Fines,	145 50
Cold Storage Fines,	678 00
Food Fines, Act of 1909,	9,087 70
Milk Fines, Act of 1901,	50 00
Milk Fines, Act of 1911,	5,335 00
Vinegar Fines,	2,269 98
Egg Fines,	1,521 35
Non-Alcoholic Drink Fines,	2,720 70
Sausage Fines,	527 20
Ice Cream Fines,	1,393 50
Lard Fines,	253 70
Fruit Syrup Fines,	130 60
Total Receipts,	\$225,910 78
Total Expenditures,	73,271 41
	\$152,639 37

THE ANNUAL REPORT OF THE BUREAU OF ZOOLOGY OF THE DEPARTMENT OF AGRICULTURE

To the Secretary of Agriculture:

Dear Sir: I take pleasure in herewith presenting to you my Twelfth Annual Report of the Bureau of Zoology of the Department of Agriculture. During the year 1914 the work of this Bureau has made satisfactory progress, giving proper attention to the established duties of the office, and also embracing such new features as in the course of the year were found necessary or advisable.

It is my pleasure to recognize the efficiency of the employees, and to call especial attention to the interest shown by the field men, or inspectors and demonstrators, in the successful prosecution of their duties. Every person has apparently striven to his utmost capacity to make the work successful in reaching the public in such a way as to rendering efficient and satisfactory service.

The work of the Bureau has been prosecuted through various channels, such as personal correspondence or letters, publications in the form of both the Bi-Monthly Bulletin and the Weekly News Letter, the Nursery Inspection Work, the Apiary Inspection Service, the Inspection of Importations, the Public Demonstration Work, known as Orchard Demonstrations, and additional orchard work known as Supervision Orchards, as well as indirect Inspection of Orchards and Farms for destructive insects and plant diseases, with the addition of the Inspection of Granaries to detect granary pests and give all needed assistance where possible; and also Lectures, as well as Investigations, and the publication of results, and such other means as appear to be desirable and efficient in rendering the best possible public service through this office as directed by laws.

LETTERS WRITTEN.

By far the greater part of the indoor service of this office is in the attention that must be given to personal correspondence. From every county of the State we are liable to receive scores of letters each day making inquiries concerning some possible outbreak of pests, which must have immediate attention. We occasionally receive telegrams asking for immediate reply as to the treatment of certain pests, the management of orchards, or the methods of meeting certain difficulties. To all such communications, especially to the letters, all detailed attention is given that is necessary to aid the inquirers to meet successfully the conditions before them. In all of our work we have striven toward an improvement in quality rather than an increase in quantity in agricultural and horticultural productions of this State, and this has meant the necessity of constant effort toward educating the public in new or better methods of crop production, with special reference to pest suppression.

In order to give the instruction necessary to help individuals, letters from this office generally must contain great details, and consequently they not infrequently include several pages, but the

subsequent replies, stating the results of such careful personal correspondence, show that the efforts are justified. When a man's crops are threatened by an outbreak of some pest it may mean the loss of several hundred dollars to him to fail to receive promptly the detailed information necessary for success. It is true that we have printed circulars bearing on most of the subjects of the inquiries which we receive, but there are always individual or personal conditions that must be met by correspondence in addition to the information that can be given by the sending of printed circulars. It is the personal element of our correspondence that keeps us freshly in touch with the public, and keeps the office from dwindling into a mere routine of answering letters by sending back printed circulars.

During the past year six thousand one hundred and forty-five (6145) letters were written that were of such importance as to justify keeping a record of them by copies in the records of the office. While most of these were on topics pertaining to pest suppression, fruit production, spraying, orchard management, etc., there were many other topics discussed, and practically no subject of importance to the farmer but that came to us for more or less comment or help. We have long made it a practice either to reply directly to an inquirer, or tell him where he can get the assistance he needs. As many inquiries are not of such character as to be answered from the office of the Economic Zoologist, even though they be along familiar topics, reference must be made to persons or institutions from which replies can be given, such as the U. S. Department of Agriculture, the U. S. Pomologist, the State Experiment Station, the Departments of the State College, the different Departments of the State Government, the different Bureaus of the Department of Agriculture, and even various State Experiment Stations making investigations along the particular line of which such inquiry is sometimes made.

PUBLICATIONS

The Zoological Press Letter, to the newspapers of Pennsylvania, and to all agricultural and horticultural publications that request them, has been issued regularly throughout the year to the extent of one thousand copies weekly. Each issue of this Weekly Press Letter contains articles, each of about one-third column in length, and treating some subject of timely interest or importance. It has been the means of reaching the public in a most effective, immediate and economical manner. For example, when we commenced to see evidence of an outbreak of the army worm we prepared a Weekly News Letter upon this subject, and reached practically all the newspapers of Pennsylvania, thus many of them had the articles on this subject in print even before the army worm made its appearance on the lawns of their readers, or but a day or two thereafter. The economy of efficiency of this prompt service was generally recognized throughout the State, not only in the suppression of this pest, but also of others.

Another example of its timeliness and efficiency is in our recommendation to use red cedar trees grown in this State for Christmas trees instead of cutting the pine and spruce trees. This is because the disease of the apple, commonly known as cedar rust, is spreading in orchards especially in the southern part of the State; and, in fact, is becoming quite serious in some orchards. It is known that it

has a necessary alternating stage on the red cedar in the form of the cedar apple, and it is agreed by plant pathologists that if all the red cedar trees were destroyed the cedar rust of the leaves and fruit of the apple would be at an end. Hence the suggestion issued in the Weekly Press Letter just before Christmas, to the effect that since Christmas trees were to be used, it was desirable from an economic standpoint, that they should be of the red cedar.

It is unfortunate that we do not have the authority to issue several thousand copies of this Weekly Press Letter, in order to supply the needs of individual citizens who desire to be placed upon the mailing list, and it is hoped that the State will find it possible to remedy this trouble in the future.

THE BI-MONTHLY BULLETIN

The Bi-Monthly Bulletin of the Bureau of Zoology was prepared regularly, and, excepting for the unavoidable delays in the hands of the State Printer, was issued regularly. The subjects treated during 1914 were as follows:

January-March, 1914, Vol. IV, Nos. 1 and 2, "Some Birds of Pennsylvania." (Continued).

May-July, 1914, Vol. IV, Nos. 3 and 4, "Pests of Truck and Field Crops. Report of Inspection of Nurseries and Importations. Demonstration and Supervision Orchards."

The calls for the Bulletins of this office, giving results of original studies of the Reptilia and Amphibia of Pennsylvania, have continued in an unprecedented manner. From all the States of the Union and all countries in the world have come requests for these Bulletins from scientific workers. They have helped to create a popular interest in these subjects such as never before existed, and have been especially helpful to teachers, who frequently write to us for more literature and for further information on the subjects. It appears that it is quite desirable to republish in one volume the set of our bulletins on the Birds of Pennsylvania, and another on the Reptiles and Amphibians of this State; and it is to be hoped that those persons who are interested in receiving the benefits of such publications will see that the State Legislature provides therefor.

NURSERY INSPECTION

The Nursery Inspection service was originally the sole service rendered to the public through the office of the Economic Zoologist. It was and remains of fundamental importance. It is necessary that the nurseries be inspected with the greatest of care by trained persons to detect the presence of obnoxious insects and plant diseases, and to prevent the dissemination of pests over the State. It was found that the inspection during the growing season was not sufficient, for the two important reasons that the leaves prevented perfectly satisfactory results of the inspection by the inspector, and also there was a possibility of reinfestation or infection after the leaves fell. Therefore, the nurseries are inspected also during the dormant season. There is no State in the Union which has as many nurseries as Pennsylvania that does as much in regard to a complete semi-annual inspection of all of its nurseries as does this State. The greatest care is taken to watch carefully for all traces of plant dis-

eases and all forms of insects. When the least indication of any unfamiliar pest is found it is made the object of study until it is worked out, as, for example, in our study and original publication on the peach bud mite.

In addition to the inspection of nurseries we have made inspection of all greenhouses that grow florists' plants for shipping by mail or express, in order to see that these are properly inspected and licensed, so they can comply with the Federal requirements, especially with the parcel post regulations in regard to tagging with a certificate of inspection all such stock to be shipped or mailed.

The Nursery Inspection work has been chiefly in charge of Mr. E. B. Engle, assisted by all of the orchard inspectors in whose districts were any nurseries demanding attention. The report of this particular line of service of this office is as follows:

NUMBER OF NURSERIES INSPECTED IN 1914

Counties	First Inspection	Second Inspection*
Adams,	19	19
Allegheny,	3	3
Beaver,	4	2
Berks,	2	1
Blair,	1	1
Bradford,	1	.....
Bucks,	9	8
Butler,	2	2
Carbon,	1	.....
Centre,	1	1
Chester,	14	12
Clearfield,	2	1
Columbia,	3	3
Crawford,	9	1
Cumberland,	1	1
Dauphin,	11	6
Delaware,	9	9
Erie,	24	13
Franklin,	3	2
Huntingdon,	1	1
Juniata,	5	.....
Lackawanna,	2	2
Lancaster,	11	11
Lawrence,	2	2
Lehigh,	2	1
Luzerne,	5	5
Lycoming,	2	.....
Mercer,	11	2
Mifflin,	1	1
Montgomery,	16	15
Northampton,	3	3
Perry,	2	2
Philadelphia,	12	10
Potter,	1	1
Snyder,	15	13
Susquehanna,	2	.....
Tioga,	2	1
Union,	1	1
Warren,	1	1
Wayne,	2	2
Westmoreland,	1	1
Wyoming,	6	1
York,	9	9
Totals,	234	170

*The Second Inspection did not include those growing berry plants only.

PLANTS IMPORTED INTO PENNSYLVANIA AND INSPECTED DURING THE YEAR 1914

Month	Number of Packages	Number of Plants
January,	202	659,177
February,	503	742,496
March,	1,956	679,993
April,	1,151	176,896
May,	310	10,374
June,	30	1,075
July,	3	52
September,	99	4,169
October,	1,573	118,485
November,	751	150,021
December,	260	155,565
Miscellaneous,	200	89,399
Totals,	7,038	2,787,702

INSPECTION OF IMPORTED STOCK

It is exceedingly important that the great number of destructive insect pests and plant diseases which are found destructive in certain parts of the earth be kept out of Pennsylvania by a strict and careful inspection service of all importations of plants. It is not desirable that our citizens be prohibited the advantages of importing good nursery stock, or new or desirable varieties of trees, shrubs, plants, seeds, bulbs, etc.; and to hedge our State about with strict quarantine laws entirely prohibiting such importations would be gross injustice to our progressive citizens. It is much better to permit ready trade with all parts of the earth, but to inspect the imported material as soon as possible after its arrival. This is done by co-operation with the Federal Government. Use is made chiefly of the orchard inspectors of the Bureau of Zoology for inspecting importations of trees, shrubs, plants, bulbs, and often even seeds after they arrive at their destination.

By a system of complete reports the office is notified concerning the arrival of each shipment at port of entry, and its destination, whether it be by parcel post, by express or by freight. The orchard inspector in charge of the district to which it is consigned is notified and gets into touch with the consignee, and just as soon as possible after its arrival he goes to the premises and thoroughly inspects the shipment. In some cases it may be only a few plants sent by mail, but there is a possibility of the introduction and spread of the fearfully destructive Brown-tail moth or Gipsy moth, or of such diseases as the white pine fungus, which is destructive to the white pine forests in foreign countries. It may be a box containing trees or shrubs consigned to a private grower for the adornment of his premises, or trees for planting in his orchard, or it may be a large shipment of carloads of nursery stock by freight, containing tens of thousands of trees. All such shipments are inspected with the greatest possible thoroughness and most careful scrutiny; and it is sufficient to say that this work, though laborious in the extreme, has resulted in keeping out of Pennsylvania many serious pests that otherwise would have been introduced, and which would have added to the destructive agencies that are now at work reducing the in-

come of the growers in this State. Through making use of the trained orchard inspectors in the different districts of the State the expense of this important service is greatly reduced. A detailed report of the inspection of importations is as follows:

INSECT PESTS AND DISEASES FOUND ON PLANTS IMPORTED DURING THE YEAR 1914

Country in Which Plants Were Grown.	Insects and Diseases Found.	Host Plants.
HOLLAND:		
(697,621 plants),	Oyster shell scale, Caterpillars (sp?), Mite eggs, Chermes sp., Eggs of lace-bugs, White fly, Soft scale, Bagworm (sp?), Aphids (sp.?), Lecanium scale, Mites, Armored scale (sp.?), Lepidoterous puæ (sp.?), Woolly aphids, Juniper scale,	Boxwood (20 shipments). Rhododendron (3), Norway maple. Juniperus (2) and Abies (2). Nordman's Fir (2), Pinus mughus. Rhododendron (3). Azelea. Palms. Boxwood. Norway spruce, Japanese maple, Norway maple. Boxwood. Juniper (2), Scotch elms. Boxwood. Boxwood. Beech. Juniper.
	Diseases:	
	Fungus leaf-spot, Pestalozzia sp., Canker,	Rhododendron (5). Rhododendron (26). Rose linden.
BELGIUM:		
(113,436 plants),	White fly, Aspidiotus hederæ (?), Eggs of lace-bugs, Mealy bugs, Spider eggs, Soft scale (sp.?), Red aphids (sp.?), Scale insects (Aspidiotus sp.?), Lecanium (sp.?), Red spider, Aspidiotus (sp.?), Mites, Small red mite, Egg-cases of spiders,	Azalea (17 shipments). Kentia, palms. Rhododendron. Auracaria (2), palms (2). Rhododendron. Bay trees (5), palms (7), Kentia, Metrosideros. Palms. Palms. Bay trees (4), palms. Palms. Kentia. Vignes depleine terre. Oriental spruce. Thuja. (Arbor Vitæ).
	Diseases:	
	Pestalozzia sp., Colletotrichum omniverum,	Rhododendron. Aspidistra.
FRANCE:		
(1,744,991 plants),	Woolly aphid, Eggs of rusty tussock moth, .. Oyster-shell scale, Scurfy scale, Caterpillars and cocoons,	Apple seedlings. Apple seedlings. Lilac. Crab. Apple and quince stocks, barberries.
	Diseases:	
	Root gall and hairy root,	Apple seedlings.
GRAND DUCHY OF LUXEMBURG:		
(198 plants),	None.	
GERMANY:		
(27,324 plants),	Soft scale, Aphis eggs, Small beetles (sp.?),	Camellia. Camellia. Coniferous trees.

INSECT PESTS AND DISEASES FOUND ON PLANTS IMPORTED DURING
THE YEAR 1914—Continued

Country in Which Plants Were Grown.	Insects and Diseases Found.	Host Plants.
ENGLAND:		
(112,609 plants),	Mite eggs,	Abies.
	Diseases:	
	Fungus,	Common holly.
SCOTLAND:		
(33,006 plants),	None.	.
IRELAND:		
(48,677 plants),	Canker,	Rose (2 shipments).
ITALY:		
(2,025 plants),	None.	
JAPAN:		
(17,009 plants),	Small white aphid (sp.?), Lepidosaphes nuesteadi, Aspidiotus ancyclus, Scale (sp.?), Boring larva, Insect eggs (sp.?),	Viburnum. Juniper. Hlex. Hlex (2), Azalea, Crataegue. Thuja pyramidalis. Cycas stems.
CANADA:		
(300 lbs. white pine seed),	None.	
BERMUDA:		
(12 plants),	None.	
ISLE OF PINES:		
(2,167 plants),	None.	
TRINIDAD (B. W. INDIES):		
(7,576 plants),	None.	
GUATEMALA:		
(3 plants),	None.	
COLOMBIA:		
(240 plants),	Cattleya flies, Spiders, Cladosporium cattleyae, Volutella sphaeriformis, Pythium sp., Scale insects (sp.?), Ants, Mites, Roaches,	Orchids (3 shipments). Orchids (2 shipments). Orchids (2 shipments). Orchids (2 shipments). Orchids (2 shipments). Orchids. Orchids. Orchids. Orchids.
	Disease:	
	Soft black rot,	Orchids.
BRAZIL:		
(500 plants),	None.	
PHILIPPINE ISLANDS:		
(40 plants),	None.	

INSPECTION OF FLORISTS' STOCK

The Federal Postal Regulations are that plants can not be sent by mail without bearing a certificate of inspection by a State officer, stating that they are free from injurious insect pests and plant diseases. In this State there are large florists who ship not only by freight and express, but also by parcel post. It is important that their stock be inspected once or twice per year, and that any pests found thereon be destroyed completely, and that the florists be given certificates of inspection showing the freedom of their stock from such pests, in order to permit the shipment of said stock by mail when so desired. Proper attention is given to this service, and greenhouses are inspected without charge to the owners, the same as are nurseries. Of course, there are many greenhouses from which shipments are not to be made by parcel post, and which, indeed, are not sending away their stock, but are selling it only locally, and these are not regularly inspected, but the owners are given all possible help in detecting and suppressing pests. It is probable that a beneficial advance step in the suppression of the spread of pests would be found in the requirement that all greenhouse stock shall be inspected and certified to be clean before it can be offered for sale at any time and place. This would at least help to keep the pests off of house plants.

ORCHARD INSPECTION

One of the very important features of the work of the Bureau of Zoology has been the continuation of the inspection of orchards in the State of Pennsylvania. Tens of thousands of growers have had pests that they did not recognize, and consequently that they could not suppress. Many persons have produced such poor fruit that they were discouraged, and thousands of orchards have been killed by the San Jose scale or other insects or diseases. We gave a number of thoroughly practical men the special training necessary to equip them for successful service in the orchard inspection work, and sent them over the State of Pennsylvania with instructions to inspect every orchard with the greatest possible care, and to report to the owners immediately and directly just what pests (both insects and diseases) were to be found, and also to report the same to this office. When such reports are received here they are systematically filed for future reference, which at times proves to be very important. The respective owners are also informed by letter concerning the pests that were found, and are given detailed printed instructions as to how and when to treat them for their suppression or for the prevention of further damage.

One can scarcely realize how tremendous was the task of inspecting every fruit tree in every yard, garden, and orchard of the State of Pennsylvania. It meant a personal visit by a competent inspector to two hundred and twenty-five thousand (225,000) farms, and more than that many suburban boroughs and village premises, which are not properly classed as "farms." It, therefore, meant the inspection of at least five hundred thousand (500,000) premises, containing tens of millions of fruit trees. To pass by or slight a single one might mean to neglect an opportunity to discover the incipient outbreak of some seriously destructive pest, like the San Jose scale,

the Gypsy moth or the Brown-tail moth. Often a village resident with but a few trees takes more interest in them than does a country resident, and earnestly seeks advice for their protection. When this is not given he produces inferior fruits, or loses his trees, and thus his property is destroyed. For example, the borough of Shipensburg in Cumberland county was once known as the "Town of Fruit Trees." Practically every resident grew his own fruits on his own limited premises. The San Jose scale came in, and spread more rapidly in the town than in the country, as is always the case. It soon worked havoc with the trees, until at the present time there is scarcely one of the older fruit trees left within the borough limits, and almost the fruit is produce where formerly there were hundreds of barrels. Had this inspection service been started in time the citizens there would have been taught to recognize and suppress the pests that were destroying their trees. As it is, they can do nothing more than to plant again with the knowledge that it is possible to build new and better structures upon the embers of the old by following the directions that are now so readily obtainable. In this new planting also they may obtain expert advice as to the best varieties for home use, which is an important item for any person planting trees.

The detailed orchard inspection service was undertaken ten years ago, or in 1904. We have had only funds enough to employ an average inspecting force of about twenty-five (25) men. This gave to each inspector a district comprehending more than two and one-half counties. This inspection service was of course interrupted by the orchard demonstration and supervision duties, by the nursery inspection in his district, by the inspection of importations, and by other special duties, as well as by bad weather; but it was continued with all energy possible.

A daily report was made giving the details of the inspections made by each man. A record of this is kept in the office, showing just where he was engaged, and the kind and extent of the service rendered. An effort was made to complete the inspections systematically by townships. This service was continued year after year, finishing one county after another, until now it is completed in every county of the State excepting six, and it will require but a few weeks to complete the remainder. It has reached the people, and has awakened them to a realization of what pests are present, and has given them definite instructions as to how to suppress these pests and produce better crops. They have followed the instructions given, and as a result Pennsylvania produced far more and better fruits last year than ever before. In fact, last year she rose from as low as about seventh in the relative rank of fruit production to second only the first being the State of New York. Through such work as this Pennsylvania is forging ahead. The results are unquestionable. The rural people know this to be a fact.

It has been so long since the orchard inspection work was undertaken that many new orchards have been planted, and the demand for it is far greater than ever before because people know that it has become more helpful. It has but recently been made to include the inspection of grains in bins, potatoes and fruits in cellars, and pests on farm and truck crops. It can well be developed along these lines to reach much more than the orchard or fruit service. To do this

properly a greater number of inspectors is necessary, and to secure the benefits of such service for our citizens a large appropriation is needed. This Bureau should have for this work at least seventy-five thousand dollars (\$75,000) annually, as the present appropriation is but forty thousand dollars (\$40,000).

DEMONSTRATION ORCHARDS

We soon found in our work with pest suppression that many orchard owners did not know how to use modern apparatus, nor how to make and apply the insecticides and fungicides essential to pest control. It becomes at once obvious that satisfactory results can never be obtained by simply telling a man what to do. He must be *shown how*, and we undertook a definite demonstration service in an extensive way in 1904, although it was started in a limited and imperfect manner by us, originally in 1903. At first the demonstrators were required to drive through the country, taking with them in a wagon all the material and apparatus necessary for making and applying the proper spray liquids. This meant that they should transport boiling kettles, spray pumps mounted on barrels, hose, extension rods, etc. We at first selected orchards belonging to public institutions as the chief places for demonstration service. We soon found by practical experience that better care was given to private orchards, and that more definite records could be kept there showing the comparative results of proper orchard management. When we commenced to give demonstrations on private premises it became evident that the owners of the premises should by all means own and operate their own spraying apparatus, and consequently the plans developed until now each owner of a demonstration orchard must own his own apparatus, and furnish his own material, and transport the demonstrator to and from the nearest railroad or trolley station, and furnish him board and lodging while at his premises. This he is willing to do, because he realizes that he is procuring expert service, and enough of it to fully pay for the expense that he incurs. At the same time such arrangement greatly reduced the cost to the State. This is the reason why we are able to have such an extremely large number of demonstration orchards in this State, together with the other extensive duties performed under the limited amount of appropriation that is available. The total number of demonstration orchards in this State during this year was two hundred and eighty-seven (287). This is greater than the total number of demonstration orchards, combined, in all the other states of the Union. These orchards are selected in reference to their availability to the public for the purpose of giving public demonstrations. The date is announced several days before the demonstrator is to be present. Posters like sale bills are displayed in the country, and local papers are requested to announce the time and place of the demonstration.

Our demonstrator always makes it a point to be present at the appointed time and place, rain or shine. This year out of four hundred and fifteen (415) public demonstrations that were scheduled there were not more than five (5) at which the demonstrator failed to be present. The assurance of the presence of the demonstrator gives the public confidence, and men and women attend these meetings regardless of weather. When it rains a lecture is given in the

barn. In some instances the attendance has amounted to hundreds. The visitors have gone home and practiced the methods of the demonstrator, and have afterwards reported efficient results in pest suppression.

As this is the fundamental purpose of the demonstrations we are gratified to know that such results follow.

Notwithstanding the fact that the owner of the demonstration orchard is required to furnish his own material and apparatus, and transport and board the demonstrators, the demand for these demonstration orchards is increasing continuously. However, as they are solely for the purpose of reaching the greatest number of people possible in a practical means of demonstration, we must limit such orchards to regions where it is impossible for people to reach other demonstrations with ease.

The demonstrator does real work when present in the demonstration orchard, and does not stop with merely giving theoretical suggestions or directions. He makes the spray materials, and fixes up the spray pump to show how connections should be made, and how the hose is to be repaired and the nozzle adjusted. He prunes trees from small to large, because pruning is necessary in good fruit production, and is thus a part of his essential service. The pruning, of course, is always done before spraying. He sprays trees, showing how to make and apply the material to obtain the best results.

In many cases the results have indeed been remarkable. At the Huntingdon Reformatory, for example, the Economic Zoologist was present at a meeting in the orchard to study the results of proper methods of pruning and spraying, when a large crowd of visiting men and women walked carefully through the orchard searching for wormy or defective apples, and failed to find two such fruits in each one hundred specimens examined. In other words, the results of spraying, with an ordinary barrel pump, were more than ninety-eight per cent. perfect fruits.

Similar results were found in orchards in Berks county, at the Berks County Almshouse, at Shillington, where similar demonstrations were given. Unfortunately as the management of these orchards changed hands, they were withdrawn from the demonstration service, and we are informed that they afterwards perished from the effects of pests.

There can be no doubt whatever of the efficiency of the demonstration service in the specific work that is legally authorized for the suppression of pests. In every county of Pennsylvania there are now dozens of fruit growers who recognize this fact, and who would be unwilling to see the work suspended in their respective regions. This service has done more than any other to insure the great improvement increase in the quality and quantity of Pennsylvania fruits.

We thought at one time that after two or three years it would not be necessary to continue the orchard demonstration work, because the citizens would not need it, and consequently would not desire it; but the learner is always ambitious for more, and the practical orchard grower is the most interested learner of all, because he can soon be taught the benefits of new and improved methods in producing fruits of quality that sell better than those formerly produced by him.

It is to keep up thoroughly with the times, and to keep informed in the most efficient and practical manner of the progress that is being made, that the thousands of citizens of this State continue to call for the demonstration service. The detailed report of this service is as follows:

County	Number of demonstra- tion orchards	Number of demonstra- tions held	Number of demonstra- tion attendance
Adams,	1	2	120
Allegheny,	9	14	677
Armstrong,	4	6	245
Beaver,	7	10	101
Bedford,	6	7	70
Berks,	6	8	368
Blair,	5	6	145
Bradford,	16	27	579
Bucks,	5	9	115
Butler,	7	13	107
Cambria,	7	18	397
Cameron,	2	2	59
Carbon,	2	2	53
Centre,	3	4	42
Chester,	5	7	90
Clarion,	3	4	92
Clearfield,	5	9	90
Clinton,	1	1	32
Columbia,	6	9	113
Crawford,	3	6	95
Cumberland,	1	1	35
Dauphin,	3	4	70
Delaware,	2	3	44
Elk,	1	1	10
Erie,	4	5	126
Fayette,	5	1	.....
Forest,	1	1	12
Franklin,	3	5	101
Fulton,	1	1	23
Greene,	3	3	67
Huntingdon,	5	5	49
Indiana,	2	2	19
Jefferson,	7	9	191
Juniata,	2	3	28
Lackawanna,	5	10	104
Lancaster,	7	7	201
Lawrence,	4	7	63
Lebanon,	4	5	71
Lehigh,	2	2	10
Luzerne,	3	5	46
Lycoming,	6	7	45
McKean,	3	5	52
Mercer,	4	6	37
Mifflin,	3	3	26
Monroe,	3	3	100
Montgomery,	7	9	118
Montour,	2	2	18
Northampton,	8	13	145
Northumberland,	4	4	103
Perry,	3	5	53
Philadelphia,	2	1	85
Pike,	2	2	.....
Potter,	3	5	20
Schuylkill,	7	10	143
Snyder,	3	7	21
Somerset,	5	6	162
Sullivan,	2	2	20
Susquehanna,	3	3	32
Tioga,	6	10	120
Union,	4	8	22
Venango,	6	14	334
Warren,	3	6	50
Washington,	8	12	200
Wayne,	7	11	72
Westmoreland,	7	8	266
Wyoming,	6	7	56
York,	5	5	48
Total,	287	415	6,823

During the year 1914 the number of orchard inspections by our inspectors was fourteen thousand, five hundred and twenty-two (14,522); the number of borough inspections was three thousand and fifty-six (3,056); making a total of seventeen thousand, five hundred and seventy-eight (17,578) inspections.

SUPERVISION ORCHARDS

The requests for the demonstration service became so numerous that it was entirely impossible to meet it by the means at hand, and individual owners of orchards, farms and truck fields insisted that they had as much right to the presence and counsel of the demonstrator on their premises as had their neighbor who owned the orchard that was used for public demonstration purposes. Recognizing in part the justice of their claims, and especially the serious need of a service that could not otherwise be given, we devised the plan now known as the Supervision Orchard Service. Under this plan the demonstrator is sent to private premises to meet the owner and inspect his premises thoroughly, to detect such pests as may be present, and to point them out to him and tell and show him what to do to suppress them, and then to take hold of the work in a definite practical way, and show him just how to prune his trees, how to make his spraying materials, and how to apply the same.

One of the important features of the supervision service is that our practical expert gives to the owner a written outline directing the management of the orchard for the current year. This gives him a plan for work in regard to cultivation, sowing cover crops and catch crops, fertilizer, pruning, spraying, thinning fruit, etc. The inspector goes again to the premises later in the year and makes records as to the progress that is made, and offers such additional recommendations or suggestions as may prove of value in pest suppression or in crop production. Records of all reports and recommendations are sent to this office and kept on file, and then used in future correspondence with the owners who ask assistance from us at various times. It is no wonder that the number of supervision orchards rapidly increased under such careful and efficient service. The requests for us to give this service to others continue daily to come to the office. It is almost the same as the work in the demonstration orchards, excepting that it is not used for public meetings. However, many of the owners of supervision orchards take advantage of the opportunity to invite their friends when the inspector is to come, and there may be from two to fifty persons present at the supervision orchards on such an occasion.

The supervision service bears directly upon the fulfillment of the law authorizing this office to acquire and disseminate information concerning the suppression of pests. It is the most effective means of reaching the public in a practical way, and has done much toward helping to improve the quality and quantity of the products of Pennsylvania soil. During recent months we have found it advisable to enlarge the scope of the service in a very definite manner, and include the supervision of truck farms, gardens, farm crops and small fruits, with special reference to suppressing pests and producing better crops.

A report of the supervision work during the past year is as follows:

County	Number of supervision orchards	Number of supervision visits*
Adams,	12	12
Allegheny,	46	44
Armstrong,	11	11
Beaver,	15	14
Bedford,	10	16
Berks,	15	15
Blair,	16	13
Bradford,	37	34
Bucks,	36	49
Butler,	18	32
Cambria,	14	19
Cameron,	1	1
Carbon,	6	12
Centre,	17	27
Chester,	9	9
Clarion,	4	4
Clearfield,	4	6
Clinton,	1	2
Columbia,	4	6
Crawford,	10	11
Cumberland,	6	6
Dauphin,	7	6
Delaware,	12	7
Elk,	5	4
Erie,	14	15
Fayette,	10	5
Forest,	1	1
Franklin,	10	4
Fulton,	2	1
Greene,	4	3
Huntingdon,	11	18
Indiana,	11	10
Jefferson,	12	8
Juniata,	16	4
Lackawanna,	19	22
Lancaster,	27	21
Lawrence,	19	30
Lebanon,	24	25
Lehigh,	6	2
Luzerne,	14	13
Lycoming,	28	19
McKean,	5	2
Mercer,	20	28
Mifflin,	8	7
Monroe,	7	7
Montgomery,	19	17
Montour,	3	4
Northampton,	12	15
Northumberland,	12	11
Perry,	14	18
Philadelphia,	3	4
Pike,	4	6
Potter,	11	10
Schuylkill,	26	28
Snyder,	7	8
Somerset,	6	12
Sullivan,	3	3
Susquehanna,	33	27
Tioga,	27	8
Union,	16	26
Venango,	14	29
Warren,	10	15
Washington,	25	28
Wayne,	23	23
Westmoreland,	28	27
Wyoming,	21	19
York,	22	12
	923	953

*In the fall of 1914 all the supervision service was postponed until after the holidays in order to try to complete the inspection service over the entire State. Thus, what would have been the fall visits are not counted in this report.—H. A. S.

APIARY INSPECTION

The Legislature of 1911 enacted legislation providing for apiary inspection in Pennsylvania. This became necessary because the honey bees were becoming so diseased as to be annihilated in some sections, and thus the State was deprived of an income of a million dollars' worth of honey, and the rural people were suffering great inroads on their possessions of over a million dollars' worth of bees. The diseases of bees are readily discernible, and, in fact, are curable by one who understands them. It is not difficult to teach an apiarist how to recognize and treat bee diseases, but the man to give such instruction must himself be a practical apiarist versed in a knowledge of bees and bee diseases, and he must give the instruction by the only effective manner possible, viz., by demonstrations.

With the wise co-operation of the Legislature and the Governor, Pennsylvania passed a Bee Inspection Bill that has been pronounced by the apiary experts in this and other states as practically perfect. It properly placed the bee inspection in the hands of the Economic Zoologist of the Department of Agriculture. Unfortunately, the Legislature of 1911 did not appropriate funds for this inspection service, and consequently little could be done excepting that which was performed by voluntary inspectors. There were some advanced beekeepers who knew the bee diseases and how to treat them, and in their willingness to help their fellowmen volunteered their services, and even paid their own expenses for the bee inspection work. However, this meant that the service could not be rendered systematically and in a fully satisfactory manner, and the Legislature of 1913-1914 made a small appropriation amounting to only five hundred dollars (\$500) annually for apiary inspection in Pennsylvania. It can be seen that this is less than ten dollars (\$10) for each of the sixty-seven (67) great counties of Pennsylvania, and of course it is impossible to do a great deal with this limited appropriation; but under all circumstances it is best to do what is possible. Three able inspectors were appointed at a salary of three dollars (\$3) per day and necessary traveling expenses when away from their homes on this service. These persons were as follows:

Mr. George H. Rea, Reynoldsville, Jefferson County, Pa.

Mr. J. O. Buseman, Germantown, Philadelphia County, Pa.

Mr. F. G. Fox, Pipersville, Bucks County, Pa.

Each rendered earnest service to the Commonwealth for the limited salary mentioned above, and as a result the apiary inspection work was definitely started in the right manner.

It was found that in addition to the two important bee diseases known as American foul brood and Black brood the bees of this Commonwealth are troubled with the disease commonly known as Bee paralysis, as well as by the Wax worms or moth, and by ants. In many cases the owner did not know that he had such diseases present, and in other cases he knew there was something of the kind wrong, but was not specifically acquainted with the trouble and did not know what to do, and in other cases they knew of the presence of the disease but did not know the remedies.

The inspectors gave the bees proper treatment in shaking them from the infected honey, being careful to destroy every drop of the latter, and after getting the colonies started in clean hives found that in nearly all cases the treated colonies were cured. In only

one case did the disease reappear after treatment, and in only one other case did the treatment fail to effect a cure.

As the bees are so positively essential in the great plan of nature for the fertilization of blossoms and the setting of fruits, it can be seen that their value to this State amounts to hundreds of thousands, or even millions of dollars in an indirect manner for the owners of fruit trees, as well as directly to the bee-keepers for the honey they produce. Pennsylvania, as next to the greatest fruit producing State of the Union, can not afford to be without her bees. Prominent fruit growers keep bees in their orchards for the purpose of performing their natural and important function of cross fertilizing the blossoms and insuring the setting of the fruit. Contrary to the popular opinion, bees are not injurious or obnoxious in cutting into fruits or grapes. They only suck out the juices from damaged fruits. The causes of this injury may be various, but the bees themselves are not able to puncture the skin of the grape, and, in fact, may render a valuable service to grape growers by sucking dry the broken fruits, which otherwise would wilt and cause decay of the pulp.

There is no doubt of the tremendous value of the honey bee, and of the great justification for the State of Pennsylvania to provide well for the apiary inspection service. There have not yet been funds enough provided for inspecting more than one per cent. of the bees of this Commonwealth, and as the diseases mentioned above are virulent in their action and quick in their spread, it is important that an increased appropriation be made for this purpose, and that the work of the inspectors and demonstrators be continued along this line. The tabulated report of the apiary inspection for the year is as follows:

County	Number apairies in- spected	Number of colonies in- spected	Infested	Destroyed	Bee pests	European foul brood	American foul brood	Suspected	Dead	Treated	Cured
Bucks,	108	786	13	5	\$1	5	3	4	.....	.....	.....
Chester,	7	78	.....	.....	\$1	.....	.....	.....	.....	.....	.....
Delaware,	35	489	3	.....	\$5	.....	2	.....	1	*1	.....
Lackawanna,	1	6	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lehigh,	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Monroe,	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montgomery,	35	332	.....	8	\$6	.....	1	.....	2	2	.....
Philadelphia,	182	2,073	83	.....	\$34	4	19	17	.....	17	16
							1	†18	.....	.....	.....
Wyoming,	3	189	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total,	375	3,953	99	13	48	9	26	32	3	20	16
			135				9				

64 other than Foul Brood. 35 f. b.

*Reappeared. †All dead. §Moth. ¶Foul Brood.

LECTURES

The calls made by the public upon the Economic Zoologist for addresses or lectures are really far more than one man can meet, especially when he is busily engaged in office work. The indoor demands of the office are such as to require as much energy and effort as ordinarily would be expected of one individual with his office assistance, and the outside service means living at higher ten-

sion, doing more work, traveling day and night, but at the same time performing a service increasing in scope and efficiency such as one should be ambitious to attain when possible. The public has a right to request the personal service of such officials occasionally, and it is helpful to the latter to mingle with the people of this State and learn their conditions, needs and attainments from direct observation and experience. It would not be well for the chief of this Bureau to immure himself within the walls of this office and attempt to perform his duties through correspondence, publications and official reports only. In considering the needs and duties of the office and the work performed by the directions of the Bureau proper consideration must be given to the time and energy required for the lecture work at agricultural organizations, horticultural meetings, fairs, before schools, granges, demonstrations before special audiences, and elsewhere.

During the year the Economic Zoologist delivered thirty-four public addresses, in some cases traveling two days, as to Erie and return, for the purpose.

The lectures by the orchard inspectors have been freely given, not only at indoor public orchard meetings, but at public demonstrations, and also in grange halls, school houses, churches and elsewhere, and much good has been accomplished by this kind of service.

SCHOOL WORK

Many teachers interested in agriculture and the related sciences have applied to this office not only for publications for their pupils, but also for contributions of specimens and for aid in naming specimens collected, for the loan of lantern slides on insects, bee-keeping, birds, reptiles, amphibians, trees, spraying, pruning, etc., and also for addresses to be delivered by representatives of the office, and especially by the field demonstrators in schools in their respective districts.

When the weather is too bad for the field inspection service our orchard inspectors go to schools, and with the set of thirty charts, made in this office, showing enlarged and colored illustrations of injurious and beneficial insects, they give addresses on these subjects that are very valuable and are much appreciated. By this means plain facts concerning the fundamental principles of pest suppression have been taught to the pupils of the public schools, and the hearty response from the County Superintendents, principals and teachers has shown the high favor in which this work is regarded. In fact several County Superintendents of schools have requested our services at their institutes and special meetings, and some have cooperated with the work of this office by requesting that spraying demonstrations be given near their schools that are teaching agriculture, in order that the boys and girls could have an opportunity to attend and learn the practical lessons to be given by the demonstrator.

SCHOOL COLLECTIONS

For years we have been making a collection of insects and native animal forms of all kinds, with special regards to agriculture, and our entomological collection along this line is now one of the best

in the State or country. Records of data have been kept with great care, and these are so valuable that investigators from the Federal Government and some other states have applied to us from time to time for records in our collection, in order to embody the same in their publications, which they wish to make complete.

In making these collections of insects we desired first to make a complete typical collection of the fauna of Pennsylvania for the purpose of study, comparison and identification of others, and, second, to preserve all duplicates possible for the purpose of exchanges, and especially to place them in schools that could make proper use of them. We are now prepared to make up collections of duplicates of beneficial and injurious insects, properly labeled with both scientific and common names, and place them in the schools where they can be seen and studied and made useful, not only for teachers and pupils, but also for the agricultural people of the district who may wish to see specimens of certain insects of which they have been warned, and for which they should watch carefully. We anticipate great good to come from such school collections, and hope to see this line of work pushed to the greatest extent possible.

IDENTIFICATION OF SPECIMENS.

The most important means for any school to obtain a collection is to interest the pupils to such an extent that they will collect their own specimens. They, of course, will need help in the methods of collecting and preserving specimens, and for this purpose this office has issued a special bulletin giving directions in the taxonomy or methods of preparing collections. When collectors send specimens to us to name we are careful that they are named correctly, with both common and scientific names, and that the full classification and names are sent to the collector. It is advisable for persons wishing such aid to collect duplicate specimens that they know are exactly the same species, keeping one, and sending another to this office with the same number on each, so that they can be named by referring to their respective number.

A collection made in the vicinity of the school is far more interesting and valuable than one made elsewhere, and should be the nucleus for more extensive collections. Under the conditions of our aid, as outlined above, it is not difficult for teachers without a technical knowledge of systematic entomology and zoology to get their pupils to make collections of specimens, particularly of insects, and have these properly preserved, classified and named. There is no reason why there should not be a good large collection of both injurious and beneficial insects of the immediate surroundings in every school where agriculture, zoology or biology are taught. In addition to the help that this office gives in naming specimens, it is willing to exchange or donate material for increasing such collections.

A LIST OF PENNSYLVANIA INSECTS

There is no one thing needed at the present time by students of Pennsylvania entomology as much as a complete working list of Pennsylvania insects. This should contain illustrations of types of each important family, and state the characteristic marks or features

of each group, and give information concerning the food, habits, life history and remedies of all species of economic importance. Such a list when completed for Pennsylvanian species would contain the names of at least fifteen thousand (15,000) species, and would make a quarto book of six hundred (600) or more pages; but it would be a *vade mecum* or working basis for future entomologists and biologists in technical work, as well as in applied entomology and agriculture, for many years to come. It should be prepared by this office just as soon as is possible. In fact, we have the manuscript ready for publishing on some groups of insects as outlined above, and await only the appropriation necessary to complete the actual listing, publication and distribution of the entire list. A bill providing for such appropriation was introduced into the last Legislature, and had the strong support of the scientific men throughout the State. The Aristotle Society of Philadelphia, for example, is an organization of interested entomologists making one of its important objects the co-operation toward securing such a publication. While the measure failed in passage in the last Legislature it is certainly recommended again and hoped that it will be taken up in the next session and will receive favorable consideration in every regard.

SPECIMENS RECEIVED

Correspondents sent us many specimens of insects, reptiles, amphibians, birds, mammals, plants, weeds, etc., in connection with their communications and inquiries. Of course, such specimens are not collected by expert collectors and are not well prepared for shipment. As a result often they do not reach us in condition fit for preservation, but, on the other hand, many arrive in such condition that they can be preserved properly in the collections. In all cases they are identified accurately, and careful records are kept giving the names and dates of collection, the name of the species, the name and address of the collector or sender, and such economic or biological records as should be preserved to give any important information in regard to the specimens received. These records are occasionally useful for reference, as correspondents sometimes make additional inquiries concerning specimens sent. This shows the importance of what might be called routine clerical work, which often proves to be valuable when properly used.

It is not sufficient for us to depend upon specimens contributed by volunteer contributors and observers, as such collections would be indeed but fragmentary, irregular, and quite unsystematic. It is necessary for us to rely fully upon our own efforts to obtain fairly complete collections of any groups of animals or insects, and for this reason we assign to some employees the work of giving a portion of their time to the collection and rearing of insects in order that most careful records can be kept of their dates of appearance in each of their various stages, and such other important facts as contribute to the essential knowledge of the life history that must be kept in mind in all practical methods of rearing beneficial species or destroying those that are obnoxious.

As a result of the efforts mentioned above our collections have become very valuable, and while we do not here publish a list of the specimens received through the efforts of our own official employees it is but right that recognition be made of those that have been sent

by correspondents. The list of specimens received in this office during the last year shows something of the various species of which inquiry is made and to which it is therefore proper to direct our attention occasionally. These are as follows:

Anatis 15-punctata (Fifteen-spotted Lady Beetle).
Chilocorus bivulnerus (Twice-stabbed Lady Beetle).
Silvanus surinamensis (Saw-tooth Grain Beetle).
Dermestes lardarius (Larder Beetle).
Anthrenus scrophulariae (Carpet Beetle or "Buffalo Moth").
Alaus oculatus (Eyed Elater).
Lasioderma serricorne (Cigarette Beetle).
Amphicerus bicaudatus (Apple-twigg Borer).
Lyctus opaculus (Wood-boring Beetles), adults in oak flooring.
Macrodactylus subspinosus (Rose-bug or Rose Chafer), 10.
Lachnosterna larvæ (White Grubs).
Euphoria inda (Cetonia or Bumble Flower Beetle).
Plagionotus speciosus (Sugar Maple Long-horn Beetle).
Neoclytus erythrocephalus (A Long-horned Beetle).
Toxotus cylindricollis (A Long-horned Beetle).
Saperda candida (Adult of Round-headed Apple-tree Borer).
Obera sp. larva (A Round-headed Borer).
Typophorus canellus (A Leaf-Beetle).
Leptinotarsa 10-lineata (Potato-bug or Beetle).
Galerucella rufosanguinea (Red Leaf Beetle).
Hylesinus trifoli (Clover-root Borer).
Hemaris thysbe (Humming-bird Clear-wing Moth).
Phlegethontius celeus
Phlegethontius carolina
 (Tomato Horn-worms).
Ceratonia amyntor (Four-horned Sphinx Moth).
Apantesis virgo (Virgin Tiger-moth).
Eacles imperialis (Imperial Moth).
Noctuid pupæ (Pupæ of Cut-Worms).
Aletia argillacea (Cotton Moth).
Leucania unipuncta (Army-worm), caterpillars and moths.
Papaipema nitela (Rag-weed Borer), larvæ.
Datana integerrima (Walnut Datana Moth).
 Egg-masses of *Hemerocampa leucostigma* (White-marked Tussock Moth).
 Egg-masses of *Malacosoma disstria* (Forest Tent Caterpillar).
 Egg-masses of *Malacosoma americana* (Apple-tree Tent Caterpillar).
 Egg-masses and females of *Alsophila pometaria* (Fall Canker Moth).
Thyridopteryx ephemeraeformis (Larger Bag-worm).
Eurycyttarus confederata (Lesser Bag-worm).
Sibine stimulea (Saddle-back Caterpillar), 10.
Euclea indetermina (Slug-caterpillar).
Phobetron pithecium (Hag-moth).
Bucculatrix pomifoliella (Apple-tree Bucculatrix).
Lepidopterous larvæ (caterpillars) boring in elderberry canes.
Lepidopterous larvæ (caterpillars) on morning glory.
Ichneumonid (Ichneumon Fly).
Melissodes sp. (A Long-tongued Solitary Bee).
Bibio alhipennis (A March Fly).

BIRDS RECEIVED DURING THE YEAR 1914

Porzana carolina (Sora or Carolina Rail).

Gallinula galeata (Florida Gallinule).

Agelaius phoeniceus (Red-Winged Blackbird).

Mniotilta varia (Black and White Warbler).

Compsothlypis americana usneæ (Northern Parula Warbler).

SCALE PARASITES

The subject of scale parasites continues to prove of tremendous importance in Pennsylvania. There is no doubt of the fact that the San José scale has been destructive over entire regions, country-wide in extent, by the parasites of the San José scale. These are exceedingly minute wasp-like creatures of different species, but all, as far as I have been able to learn by careful investigation and rearing of specimens, belong to the great order of Hymenoptera or wasp-like insects.

We have given a great deal of time to the rearing and practical dissemination of scale parasites as a means of suppressing the San José scale, and have definitely succeeded in a remarkable manner in this important work. We have not been greatly interested in the identification of species for the reason that this has not been as important as some of our self-appointed critics would make others suppose. For example, the most common species of scale parasite in this State has been identified by one of the leading entomologists of the country as *Prospatella aurantii*, and by another *P. perniciosi*. When one of these prominent entomologists insists that it is one species, and another insists that it is the other, and the parasites go on destroying the scale. What matters it to us whether it be of one scientific name or of another. The important point is to aid it in its good work, and see to it that it is introduced into those parts of the State and country which it has not yet reached, and let it do in the orchards of other growers in the State just what we know it has done in the large orchards belonging to the writer and those of his neighbors for many miles around his premises.

In the Annual Report of the State Entomologist of New Jersey considerable space was given to criticising our work with parasites, for the reason, as claimed by the writer, that he was afraid we would recommend the use of the parasites to the exclusion of the spray pump. This was but a presumption on his part, as we never made such a recommendation, although the fact remains that the writer owns old apple trees that were once badly infested with the San José scale, and were left entirely unsprayed for the purpose of observation and experimentation, and during the past year these same trees produced fruits as fine as any produced in the country, which were absolutely free from San José scale. In fact, there is no San José scale to be found alive on any of these trees at the present time, as it has been cleaned up entirely by the work of the parasites alone.

We are prepared to emphasize the point made in the Annual Report of this office for last year, to the effect that it is possible to transport these parasites by mail or express to a considerable distance and introduce them into other infested orchards. We have succeeded in introducing the parasites into certain orchards of

Michigan, Ohio, Indiana, Illinois, Virginia and New York, besides several within the State of Pennsylvania. This was done with care, and there can be no reasonable question of the success of the experiment. It is certainly the scientific manner of fighting the San José scale, and it is the most important piece of practical entomological work that has been reported as having been done in America, or in the whole world during the past year. A paper on this subject was read by the Economic Zoologist before the American Association of Economic Entomologists, meeting with the American Association for the Advancement of Science, at Philadelphia, in December, 1914. It will be published in the future issue of the Bi-Monthly Bulletin of the Bureau of Zoology.

Respectfully submitted,

H. A. SURFACE,

State Zoologist.

REPORT OF THE STATE VETERINARIAN

Hon. N. B. Critchfield, *Secretary of Agriculture*.

Dear Sir: I have the honor to submit herewith the report of the State Veterinarian for the year 1914.

With the exception of the recent outbreak of foot-and-mouth disease there is nothing new or unusual to report. The ordinary diseases that are present and rather common in Pennsylvania at all times are tuberculosis, glanders, hog cholera, rabies, contagious abortion, calf scours and joint evil. The losses from these diseases each year are far too great. Much better results may be expected when there is a more united effort put forth to stamp them out. We have made progress in recent years in handling glanders and hog cholera. There has been no remedy discovered yet that will cure either disease. In glanders our progress has been made in the improved method for diagnosis, while in hog cholera it has been in the vaccination for prevention.

In former times glanders was recognized in horses only when the disease was far advanced. Before this stage was reached the glandered animal may have passed the infection on to man, horses and mules, which may have died from it before the symptoms had attracted attention in the horse that gave the infection. Later the mallein test came into use. This test was somewhat similar to the tuberculin test for tuberculosis, but much less reliable and mistakes were often made. In some cases healthy horses were condemned and destroyed by its use and in others the test failed to reveal the presence of the disease. For the past few years we have been using a combination test for glanders that is reliable in practically every case. These tests are made jointly in the stable and laboratory. A special preparation of mallein is dropped in the suspected horse's eye; at the same time a sample of blood is taken from the jugular vein for laboratory examination. If the animal has glanders the eye becomes inflamed in about twelve hours and clears up fully during the next twenty-four hours. If the horse is free from glanders the eye remains clear. The blood examination serves as a check on the eye test. Both of these tests are extremely delicate and often will reveal the presence of glanders in a horse perhaps a year or more before there is a discharge from the nose, an open sore on the body or any other observable symptom. Such an animal is often a greater source of danger than one in the last stages of the disease for the reason that no precautions are taken in the first instance and reasonably safe measures are practiced with the horse with the open lesions.

Where an open case of glanders is found in a stable, it is promptly destroyed and all other susceptible animals are given the eye and blood tests. In some cases from two to twenty per cent. of the non-suspected horses fail to pass these tests. A careful physical examination may show no suspicious symptoms even to one thoroughly trained in the diseases of animals, yet the State recommends that they should be destroyed at once. They are appraised at a price not to exceed \$60 and destroyed. An autopsy is then made to see if the

condemnation was justified. About 300 such autopsies have been made and no mistakes have been found. It is often difficult to convince the owner that his horse has glanders when it is perfectly healthy so far as anybody can see. The State could safely pay an owner full value in every case where a mistake is made. The owner would be more easily convinced at times if the State could pay him full value if a mistake should be made.

Glanders is seldom seen in the rural section of the State. It is much less common now than in previous years in the large cities and should be exterminated entirely. This could be done rather easily if we were not compelled to purchase horses from other states. It was considered wise to close the public drinking fountains in Philadelphia during the past summer to prevent the further spread of what promised to be rather a large outbreak of glanders. The disease soon subsided and the troughs and fountains were again opened in the fall.

Much more security is felt now in raising hogs; the last census shows a decided increase in our swine valuation—it is now \$15,594,000, which is nearly double the valuation of 1900. Most of the security has been brought about by a better understanding of hog cholera. The disease would often wipe out a good herd of hogs in a few days and the owner was helpless to prevent or cure the disease. In anti-hog cholera serum we have a safe and efficient means of prevention. Much more can be accomplished now than in former times by careful sanitary measures. Most hog raisers know how the disease is spread and can fight it successfully with sanitary measures. More might be done in this line. There is a tendency to depend too much on medicine and vaccination even by those intelligently interested. Pennsylvania still uses the serum method of vaccination alone and then only in infected herds. Many other states are still practicing the simultaneous method and in most cases it will be observed that the disease is more widely spread than it was before vaccination was discovered. The simultaneous method of vaccination may be good for the individual breeder, but for the State and country at large there can be no doubt of its being a menace to the hog raising industry when it is used indiscriminately. In the simultaneous method of vaccination the virus is given to produce hog cholera, then the serum is given to check the disease and make it run a mild course. The nearer the victim comes to dying and lives, the more sure are his chances for obtaining a lasting immunity. Every farm upon which the simultaneous method of vaccination is used may be considered an infected farm and the disease can be spread from such farms in the same way as from a farm where the disease has occurred accidentally. If serum alone is used in an infected herd, the immunity is just as lasting as where the disease is produced purposely by injecting virus.

The simultaneous method of treatment would not be so bad if its use were confined to infected herds only. In these it is not necessary for the reason that the disease will be contracted accidentally. Where virus is used on sound and uninfected herds, the premises become infected and should be looked upon as a menace to hogs in the neighborhood. The more herds vaccinated in this way, the greater the danger to the hog raising community, unless the system is continued as far as the industry extends. The simultaneous

method of vaccination may be used safely under certain conditions; these conditions cannot be followed profitably or safely at present by the average hog raiser.

The State furnishes serum free to the farmers where the disease exists. It must be used by one who knows the disease and has been trained in administering the remedy.

Rabies is found in most all sections of Pennsylvania. It effects all live-stock and occasionally poultry. Carniverous animals are the most predisposed to it and are the ones that spread it. There has been nothing new discovered in reference to handling this disease. The laboratory diagnosis is considered positive. It is believed that but few mistakes are made in ascertaining whether the animal was or was not effected with the disease. Where a case of rabies is suspected, the head of the animal may be sent to the laboratory of the State Livestock Sanitary Board in Philadelphia and within twenty-four hours the shipper can be notified definitely whether or not the case is rabies. This information is frequently asked for and is of vast importance in cases where persons have been bitten by animals suspected of having rabies. There has not been as much rabies during the past year as in some previous years. It is customary to kill animals that have been bitten by dogs that were known to have had the disease. The State allows no indemnity for damage done to stock by rabid dogs. It is possible in some cases to indemnify the owners for such losses from the local dog tax fund. It is also possible to have the Pasteur treatment given to poor people and pay for it out of the same fund. The most effectual way to control rabies would be to destroy the worthless, homeless dogs. This would be a blessing to the sheep industry, as well as assist greatly in preventing the spread of rabies. It would seem that there might be some just law provided that would compel people to confine dogs that are kept as pets or for pleasure and force the killing of those that are homeless or uncared for.

Contagious abortion in cattle is still receiving much study. Breeders are becoming more familiar with the way the disease is conveyed from farm to farm and from animal to animal, and more effectual sanitary precautions are being practiced in breeding herds.

A rather extensive experiment was tried during the past two years in the use of medicated methylene blue as a cure for the disease. Many inquiries were received in reference to the treatment which had been mentioned in a number of the dairy papers. The treatment was first recommended by Dr. Rich, of Vermont, and the State supplied with medicine with instructions for its use. Some of our breeders claim to have had good results with the treatment, but the evidence collected altogether has shown to be of no practical benefit. The most effectual method known for combatting the disease is in the line of antiseptics. Considerable work has been done by the State in reference to diagnosing the disease. It has been found that the blood examination or what is known as the complement fixation test will show the infected animals in a high percentage of cases. When the diseased animals are known, can be isolated and kept under antiseptic conditions, it is possible to keep the disease from spreading to other members in the herd and advantage can be taken of the fact that aborting animals usually develop an immunity. They seldom abort the second time and it is very unusual to find one that aborts

the third time. Some may become sterile as a result of the disease but after the second abortion they usually carry the calves to full term. It can be controlled in herds by following the instructions recommended in Circular No. 20, which is sent out by the State Live-stock Sanitary Board. Breeders of valuable cattle are recommended to adopt rigid sanitary measures for its control.

Many young animals still die each year with such diseases as naval infection, white scours, joint evil, paratyphoid infection and calf pneumonia. These diseases are practically all caused by the same class of infection organism and when once they become established in a herd or in a stable, the losses each year in young animals is very discouraging, as practically all cases are incurable and the fatality is high. The only means of meeting the losses from this class of disease is in their prevention, and prevention can only be brought about by a rigid system of sanitation or what is known in medicine as surgical cleanliness. This can be brought about in a practical way by isolating the pregnant animals, placing them in stalls that have been thoroughly cleaned and disinfected before parturition, and the dam and young animal kept in such quarters for the first week. The infection in each of these diseases is easily carried on the hands and clothing of the stable help, on the body of the dam, in troughs or buckets that have not been boiled or cleansed, and it is difficult to explain to those who are not skilled in the science of bacteriology the importance of thorough cleanliness.

These diseases, as well as foot-and-mouth disease, tuberculosis, contagious abortion, etc., can easily be carried from farm to farm in skim milk that is returned from the creamery as food for calves or pigs. These diseases may also be carried in the cans from infected herds to the creamery and thus infect the milk and other cans and then be carried to various herds in the community. To meet the dangers from spreading infection in this way, the last Legislature passed a law requiring the pasteurization of skim milk, by heating it to 178 degrees F. It is known that this temperature will kill the organisms that cause these various diseases and that milk that has been heated to this temperature can be fed safely to susceptible animals. During the last few months foot-and-mouth disease has been spread considerably through creameries by infected cans and milk returned to other farms as food for hogs and calves. In some cases farmers have objected to handling hot milk and so far we have no economical method for cooling milk promptly. For the reason many of the creamerymen have been slow about installing pasteurizing plants. An efficient method for pasteurizing skim milk can be installed in any creamery that is equipped with steam for less than \$15.00 and this form of pasteurization can be worked with a minimum of expense and labor. The only criticism offered by most creamerymen for not installing and using this method of pasteurization is the fact that farmers object to hauling hot milk, and that heated milk does not keep so well when they get it home. It is hoped that creamerymen and their patrons will soon realize the importance of pasteurizing milk that is used as food for hogs and calves and that each party will co-operate in devising methods for pasteurizing, cooling and keeping milk that will not be a means of conveying transmissible diseases from farm to farm. It is equally as important that cans should be washed and properly sterilized at the creamery or before they are returned to the patrons.

Many good breeders prefer to separate the milk at home and sell only their cream. In this way they can escape the danger of bringing new and expensive diseases to their own premises.

The Blakeslee pasteurizer does its work in a clean, efficient manner while many of the improvised methods are unsatisfactory. If the milk is heated to 180°F. with the Blakeslee, run into clean vessels, taken home in clean cans, placed immediately in cold water and fed out of clean pans when properly cooled, there will be no trouble. Milk that is too hot, too cold, or putrid, may cause digestive disturbances, especially in pigs. Faulty feeding of this kind can be overcome by a little care. In no case will the loss equal that caused by feeding unheated milk which may have been infected with tuberculosis, foot-and-mouth disease, etc.

The great question of how to handle tuberculosis is still in an unsettled condition. Practically speaking there has been no changes made in the last year in reference to eradicating or controlling the disease. During the first part of the year there was no money obtainable for paying indemnity on animals destroyed when they had been condemned as tuberculous. As soon as foot-and-mouth disease occurred in the State practically all testing for tuberculosis was stopped, for two reasons: It was thought that the disease might possibly be spread by those making the tuberculin test and the money available for controlling tuberculosis was much more needed in the eradication of foot-and-mouth disease. For these reasons there has been very little testing for tuberculosis done since the middle of October, 1914. In the herds that were tested during the past year the disease was not as extensive as in previous years. It is believed that some changes might be made in reference to handling inter-state cattle; the present law requires the tuberculin test on all animals over six months of age that are brought into the State for any purpose other than for immediate slaughter.

During the past year the State tested a great many young cattle in Lancaster and Pittsburgh. These animals came from Canada and the West. The percentage of reactions in such animals was very low, practically all the condemnations were from the dairy breeds from the State of New York. A reasonable degree of safety might be obtained by requiring a tuberculin test on no animals under one year or one and one-half years of age, allow owners the privilege of purchasing young animals on a test if they desire to do so. It would not be considered safe to allow dairy cattle to be brought in indiscriminately at present without enforcing the physical examination and a tuberculin test, but in a majority of cases the diseased animals are found in mature dairy cattle. Tuberculin tests are not urged or forced upon native herd owners and in no case can they be paid an indemnity for reacting cattle unless they are willing to comply with the requirements of the State Livestock Sanitary Board. They are required to sign an agreement before the test is applied that in case tuberculous animals are found they will have them isolated or destroyed promptly; that the stable will be promptly and properly disinfected and that they will purchase no new animals and place them in the herd until they have been tested and examined by a person authorized by the State. These restrictions make it impossible for dealers to obtain an indemnity from the State. Even with the restrictions as rigid as they have been, the applications for tuberculin

tests have been all that the State was able to handle with the amount of money available. Some have felt that the appraisements are not sufficiently high on cattle that are condemned for tuberculosis. If the limit in price for this purpose is to be raised, it will be necessary to obtain very much more money from the State Government to be used in the work of eradicating tuberculosis. Whether it is advisable to make this move is a question. A physical diagnosis has been advocated by some and principally by those who are opposed to tuberculin testing. Very little can be accomplished in exterminating tuberculosis where the physical examination alone is depended upon. It is not possible for even the best veterinarians to pick out 5% of the tuberculous cattle by a physical examination alone, and very little headway will be made in exterminating the disease when 95% of the diseased animals are allowed to remain with healthy animals. In tuberculin we still have the most positive method of detecting tuberculous animals. When properly applied it is accurate in more than 95% of cases. The State has experimented considerably during the last year with different methods for applying tuberculin. The old subcutaneous form of application is still considered best, yet good results have been obtained in many cases with what is known as the ocular test, the intra-dermal test and the intra-palpebral test. For making the last three named tests a special form of tuberculin is required. Under certain conditions they are more reliable than the subcutaneous test and the Veterinarian at the present time who is thoroughly qualified and competent to test cattle for tuberculosis should be familiar with and prepared to apply any or all of these four tests, and in addition to using them should be able to make a careful physical examination. The person who is properly equipped to make these various tests, combined with a careful physical examination, should be able to detect tuberculosis in more than 98% of the cases, and make mistakes in less than 2%. Where results so good can be obtained it would seem advisable to develop these methods to the highest possible standard and everybody concerned use his effort to do away with the careless methods that have been practiced in too many cases.

In the fall of 1908 there was an outbreak of foot-and-mouth disease in Pennsylvania. It originated in Michigan and was carried to various parts of Pennsylvania by cattle shipped from Buffalo. There were eight points of infection received about the same time. The infection extended over an area of 100 miles in length and in the part of the State where animal husbandry is most extensively practiced. The infection was found on 100 farms. 1,320 head of cattle, 877 swine, 52 sheep and 3 goats were diseased or exposed to the infection. They were appraised at \$57,702.49, promptly killed, buried and the premises were disinfected. The cost of disinfection averaged about \$100 per head. All told this outbreak cost a little over \$86,000. The Federal Bureau of Animal Industry paid two-thirds of the appraised value of the livestock destroyed and cost of disinfection. The State paid the balance. It required three months to stamp out the disease at that time. The State was then free from Aphthous Fever for a period of six years.

The recent outbreak was discovered on two farms in Lancaster county and in one cow in the Union Stock Yards at Pittsburgh on October 24, 1914. The infection has existed in something over 658

herds in 27 counties in Pennsylvania since that time. Infection was carried from the stockyards in Chicago through Pittsburgh and Lancaster to various places in Pennsylvania in a period of less than two weeks. Five days previous to October 24th we were notified that the disease had been diagnosed in two counties in southern Michigan and two others in northern Indiana. In the meantime our cattle shippers, commission men and over eight hundred veterinarians had been warned that the disease had been found in this country and that all should be on the lookout for symptoms of Aphthous Fever. In many cases infected herds were located and quarantined before suspicious symptoms had been found. Seven administration districts were established in the infected territory with head office at Harrisburg. Each district was in charge of an experienced agent of the federal and state government. The federal inspectors were appointed agents of the State Livestock Sanitary Board and cards of identification were issued to each so he could work under the State law. About one hundred trained veterinarians were employed by the federal and state governments. The work, expense, and responsibility were shared about equally by each. The work of locating and exterminating the disease was made easy from the first by the mutual co-operation of commission men, dealers, railroads, herd owners, local veterinarians, and the experienced officials in charge. The first class helped greatly by furnishing free access to records of shipments and sales. In many cases the disease was recognized and reported by the owner.

This outbreak has been the worst calamity to our stock raising industry that has ever occurred in Pennsylvania or in North America. It was forced upon us with practically no warning and came in the nature of a flood, earthquake or monstrous conflagration. Something of the extent of the disease in this country will be obtained from the following table, which was submitted by the Bureau of Animal Industry:

STATEMENT SHOWING PROGRESS OF WORK OF ERADICATION OF FOOT-AND-MOUTH DISEASE

State	Number of counties in entire State*	Number of counties infected	Number of herds infected	Number of cattle infected	Number of sheep infected	Number of swine infected	Number of goats infected	Total number of animals infected	Number Inspectors at Work Jan. 1		Progress of Work in State Jan. 15, 1915
									Veterinarians	Laymen	
Connecticut,	8	2	24	538	.....	105	.....	643	7	2	Completed.†
Delaware,	3	1	12	152	.....	49	.....	201	3	6	Completed.†
District of Columbia, .....	.....	.....	2	23	.....	5	.....	28	4	6	Completed.†
Illinois,	102	50	484	14,653	507	21,587	11	36,758	110	48	Progressing rapidly.‡
Indiana,	92	18	34	2,172	615	3,340	.....	6,127	25	18	Near completion.
Iowa,	99	6	32	979	32	1,581	.....	2,592	13	10	Near completion.
Kentucky,	119	9	39	817	.....	308	.....	1,125	22	4	Complete in 5 counties.
Maryland,	24	10	39	744	197	531	.....	1,472	22	11	Complete.
Massachusetts,	14	9	50	1,109	9	3,471	4	4,593	17	14	Slaughter completed.
Michigan,	83	15	236	2,922	802	4,004	.....	7,728	35	23	Slaughter completed.
Minnesota,	31	3	32	1,408	237	.....	.....	1,656	17	6	Completed.
Montana,	10	1	2	78	.....	26	.....	104	3	2	Slaughter completed.
New Hampshire,	21	5	23	743	6	212	.....	961	10	.....	Completed.
New Jersey,	61	11	85	3,570	60	257	2	3,899	35	51	Completed.
New York,	88	31	169	3,204	2,652	4,254	1	10,111	38	20	Nearly completed.
Ohio,	67	25	684	11,069	269	6,565	3	17,896	60	31	Nearly completed.§
Pennsylvania,	5	3	36	721	1	135	.....	857	6	16	Complete in 2 counties.
Rhode Island,	100	1	1	19	.....	15	.....	34	3	.....	Completed.
Virginia,	38	1	1	102	.....	.....	.....	102	3	.....	Completed.
Washington,	71	10	31	1,255	1,764	1,269	1	4,289	21	10	Slaughter completed.
Wisconsin, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Number of counties in each State given in order to show approximate area of State involved.

†This means all herds slaughtered and disinfection completed. House to house canvass still going on.

‡About 40 per cent. of all infection in the United States was in this State. Increasing number of inspectors available are rapidly clearing up the work. Less than 20 herds alive at last report.

§About 6 infected herds alive.

are rapidly clearing up the work. Less

We were fortunately prepared to meet the emergency. While the experience is fresh in our minds we should decide on measures that could be safely adopted to handle a similar emergency more efficiently if possible in the future. It is not safe to be unprepared for calamities of this kind. Safe and sane measures are hard to promulgate and enforce during the existence of such a plague. In times of peace we should prepare for war. The plan of extermination successfully used in the outbreaks of 1902 and 1908 was adopted in dealing with this one. As soon as the disease was reported to the Board each member favored continuing the work of extermination along the same lines that had been used six years ago. The same general plan was followed by the Bureau of Animal Industry in the twenty states in which infection was found.

It was first necessary to locate the diseased herds. Agents were sent out at once to trace up suspicious shipments. When a diseased animal was found all the cattle, hogs and sheep on the premises were placed in quarantine. In all cases the diagnosis was confirmed by the State and Federal agents. Both representatives were satisfied that the diagnosis was correct. The disease and exposed cloven-footed animals on the premises were then all appraised at their actual value and arrangements made for digging the burial trenches. In some cases the work was done by the owner of the herd while in other contractors did it. In either case the expense was borne equally by the Federal and State governments. The animals were then killed, covered with one hundred pounds of lime to each one thousand pounds of estimated animal weight and buried in a grave seven feet deep, seven feet wide and two feet in length in each mature bovine animal. Next the stable was carefully cleaned and disinfected. The owner will not be permitted to restock with cloven footed animals for ninety days from the time the premises were disinfected. In the meantime a farm to farm inspection will be made within a radius of three miles from the infected herd and each susceptible animal will be examined for any evidence of the disease. During this time the township is held in quarantine and it is necessary to obtain a permit to move, hay, straw, cattle, sheep, swine or hides.

In the beginning of the outbreak a quarantine was placed upon the whole state. This precaution appeared necessary for the reason that the disease was so wide-spread. The counties into which no interstate shipments had been made between October first and twenty-fourth were released from quarantine as soon as the records of sales and shipments were traced. A few counties had received such shipments and upon examination the animals were found free from infection. These counties were promptly released from quarantine by the State but not by the Bureau of Animal Industry. It was soon considered safe to release certain townships in counties that had considerable infection. The disease was found in twenty-seven counties. Some counties had but one or two diseased herds. The counties that received the most infection were Lebanon, Lancaster, Berks, Montgomery, York, Bucks and Chester. The farmers in these seven counties keep many cattle. It is their custom to purchase feeders in the fall and finish them for beef during the winter. Their purchases are usually made at the season of the year when this

infection occurred. At no other time could the infection have been spread so extensively and rapidly.

Number counties in State infected,	27
Number of cases in the State,	658
Number of animals appraised:	
Cattle,	13,343
Sheep,	313
Swine,	6,996
Amount of appraisement,	\$805,035 18

Aside from the expense, six hundred and fifty-eight herd owners have been tied up and prevented from carrying on the winter's work. Traffic in cattle, sheep, hogs and crops has been practically at a standstill in many parts of the state. In most cases people have met the losses and embarrassment bodily and with but one purpose and that was to get rid of the disease as soon as possible. In practically every case the main objection or criticism was that it was too long from the time a diseased herd was found till it was destroyed and the premises disinfected. In most cases people were reasonably patient in this respect. Some have wondered if a less destructive method might not be used safely for exterminating the disease. This is not to be wondered at when one considers that the death rate from the disease is so low. It is known that practically 95 per cent. of the cases will recover with no treatment except reasonable good care. In a number of cases in the recent outbreak the affected animals had recovered before they could be destroyed. The reason for taking such extreme measures in dealing with this disease is not due to the high death rate but to the fact that it is easily transmitted from animal to animal and from place to place, and it does cause a depreciation in the value of the affected animals to the extent of about \$20 per head.

We realize that the disease is not highly fatal and that recovery will take place in a high percentage of cases without even a learned course of treatment. It is one of the most highly contagious diseases of cloven footed animals and while the death rate is comparatively low the losses to animal industry are considerable. The disease has gained a foot hold in nearly all European countries and it is practically impossible for them to adopt our method for exterminating it. It is necessary to hold infected herds in quarantine for something over three months. A recent investigator in the Netherlands, where the disease is common, has shown that it costs practically \$20 per head in each infected herd to handle the disease in quarantine. This is the best they can do after many years of experience in trying to control it by the quarantine method. Their expense is figured on the loss in milk production, loss in condition of meat producing animals, loss from work in oxen, death from the disease and extra care given to those that are sick. It is doubtful if a herd owner in this country could afford to have Aphthous Fever in his herd for \$20 per head. This would not include the expense to the State and Federal government for enforcing the quarantine. It has already cost \$120 per head to care for the prize dairy herd at Chicago. If this method were adopted there would be constant unrest in the neighborhood of an infected herd. It would be necessary to increase the inspection

force to locate new centres of infection and prevent the disease from spreading. The quarantined herds should be under constant Federal or State supervision. Neither the State nor Federal government could be expected to remunerate the owners for losses sustained during the course of the disease. It has been demonstrated in all foreign countries that this method will not exterminate the disease. We cannot hope to do something that they have failed to accomplish. It will take us years to develop Veterinary Sanitary Police Regulations for handling Aphthous Fever by the quarantine method that is as good as theirs. We cannot afford to even experiment with it. It would be a calamity to the cattle, swine and sheep industry of this country to have this disease get beyond our control.

Careful records were kept by Dr. Rudovsky of the average losses from this disease in Austria. In 13,858 head of cattle on 91 farms belonging to sugar factories, and 2,054 head on 802 small farms, the losses from milk decrease, oxen incapacitated for work, loss of condition in all animals, natural death and compulsory slaughter amounted to about \$20 per head. He estimates an annual loss of over a million dollars in Austria. This is a safe estimate for the losses each year in the countries of Continental Europe. Infection comes from Russia and other eastern countries where animal hygiene measures are practically nothing and it passes rapidly westward to section of Europe where veterinary police regulations are most perfect. It has been practically impossible to exterminate Aphthous Fever from the herds in France, Belgium, Switzerland, Italy, Germany, Austria, and Holland for the reason that fresh infections are constantly being brought in from Russia, Rumania, Turkey, Siberia, etc.

The policy followed by many foreign countries is to adopt rigid quarantine measures. No animals are killed on account of this disease unless they become worthless. For them perhaps this is the cheapest and best policy but for people in North America where we are surrounded by water and ice and the infection is brought in only occasionally it seems best to continue the plan so successfully used in past outbreaks. The disease cannot be considered as a source of danger to man. Its principal importance is an economic question. If property must be destroyed and animals slaughtered for the public good the owners should be compensated for their entire loss provided it can be shown that the disease was brought about by no fault of the owner.

Under the present law our Board is limited in amount of indemnity that can be paid for animals that it is deemed necessary to destroy to \$70 for a registered bovine, \$40 for non-registered bovine, and \$10 for a sheep or hog. The United States will duplicate these amounts in the present outbreak but some animals have been destroyed that are worth from twenty to forty times the amount allowed by law. Should not the law be fixed so it would be possible to pay full value for such animals when it becomes necessary to destroy them for the benefit of the State or country? The diseases for which such extreme measures are necessary are but few. Aphthous Fever is the only one with which we have had to deal so far. Rinderpest is equally as important and there is no positive assurance that our herds may not become infected with it. The dangers from these diseases have increased wonderfully in the past few years by the progress made in transportation.

Rapid progress has been made in destroying the infection from the present outbreak of Aphthous Fever. The payment for property and stock destroyed has necessarily been held back. Under normal conditions the Board had money sufficient to meet its obligations up to June first 1915 when the present appropriation was to terminate. The Board has now petitioned the legislature for \$558,000 to reimburse the owners for losses sustained. Let us trust that the Legislature can and will make the necessary appropriation so the bills can be paid without delay.

The Bureau of Animal Industry petitioned Congress for \$2,500,000 to pay its half of the expenses in this and other states. The appropriation has been made and is now available.

In the previous outbreak of 1908 all just bills were promptly paid. For this reason it has been much easier to convince the people that they would be paid for their losses this time.

Infection during the present outbreak was carried from the original to other farms in a few cases. In nearly every place it was carried in refuse and utensils from creameries to which milk from infected herds had been sent. If the creamery refuse had been pasteurized as required by law thousand of dollars would have been saved and much annoyance prevented.

Every state should be prepared with laws, rules, regulations, agents and money to fight Aphthous Fever, rinderpest and all other transmissible diseases of livestock. The fight should be determined and persistent. A herd owner should not be a menace to his neighbors and no state should send Aphthous Fever, hog cholera, tuberculosis, glanders, etc., to other States to jeopardize their livestock interest. This can be prevented to a great extent if each state will do its part. It cannot be done without official supervision and a strong public sentiment on the part of herd owners in favor of genuine co-operation with federal, state and local authorities.

It is hoped that you will feel that the work of exterminating the disease has been honestly and promptly done and that money will soon be available for paying all just claims.

Respectfully submitted,

C. J. MARSHALL,
State Veterinarian.

FERTILIZER CONTROL

Hon. N. B. Critchfield, *Secretary of Agriculture:*

My Dear Sir: I have the honor to submit herewith a report of the Fertilizer Control of the Department, for the year 1914:

There were fifteen sampling agents employed during the year. All but three of the counties of the State were canvassed, which resulted in the securing of three thousand two hundred eighty-two samples during the spring and fall seasons, of which one thousand one hundred ninety-four were submitted for separate analysis. The remainder were composited with like samples representing the same brands and chemicals, and are included in the above one thousand one hundred ninety-four samples to the extent of three samples of each brand. The balance representing duplicates of those previously selected, were discarded.

Where deficiencies were noted in the composited samples separate analyses were made to determine the source of the same.

Summaries of the analyses made this year are presented as follows:

SUMMARY OF ANALYSES MADE SPRING, 1914

	Complete	Rock and potash	Dissolved bone	Dissolved rock	Ground bone
Number of analyses,	505	131	4	30	23
Moisture, per cent.,	8.85	9.09	6.89	9.21	5.11
Phosphoric acid:					
Total, per cent.,	9.31	10.63	15.84	15.53	21.34
Available, per cent.,	8.06	9.76	10.45	14.47	.....
Insoluble, per cent.,	1.25	.87	5.39	.84	.....
Potash, per cent.,	5.67	4.77	.....	.....	.....
Nitrogen:					
Total, per cent.,	1.81	.....	2.38	.....	3.08
Available, per cent.,	1.49	.....	1.98	.....	.....
Inactive insoluble, per cent., .....	.32	.....	.40	.....	.....
Mechanical analyses of bone:					
Fine, per cent., .....	.....	.....	.....	.....	49.00
Coarse, per cent., .....	.....	.....	.....	.....	51.00
Commercial valuation,*	\$26.93	\$15.60	\$27.23	\$13.71	\$30.15
Average selling price,*	24.72	16.79	26.25	14.48	31.43

SUMMARY OF ANALYSES MADE FALL, 1914

Number of analyses,	281	99	2	38	23
Moisture, per cent.,	8.83	8.80	7.54	8.24	5.19
Phosphoric acid:					
Total, per cent.,	9.84	11.18	11.95	15.52	23.37
Available, per cent.,	8.41	10.35	11.07	14.38	.....
Insoluble, per cent.,	1.43	.83	.88	1.14	.....
Potash, per cent.,	3.42	3.50	.....	.....	.....
Nitrogen, per cent.,	1.29	.....	.89	.....	3.40
Mechanical analyses of bone:					
Fine, .....	.....	.....	.....	.....	55.00
Coarse, .....	.....	.....	.....	.....	45.00
Commercial valuation,*	\$22.64	\$15.42	\$19.02	\$13.97	\$33.45
Average selling price,*	20.83	15.21	16.06	13.78	32.20

*Dollars per ton.

The reports of this work appear in detail in bulletins Nos. 255 and 259 of the Department.

Wherever the deficiency was found great enough and the character of the goods indicated fraudulent intent, the cases were marked for prosecution.

A close check was kept upon all fertilizers sold in the State to see that the law was complied with by registering them and paying the necessary fees thereon.

After each sampling period a careful comparison was made of the agents' records with Department records and resulted in finding a large number of mixed brands and chemicals which were sold in violation of the Act requiring registration.

Notices were sent the offending parties, calling attention to these apparent oversights and in every case where goods were so sold the manufacturers or vendors registered the same and paid the requisite fees.

This procedure, having brought about the desired ends, relieved the Department from instituting prosecutions which would have incurred expenses that could not have been paid without interfering with other more important phases of the work. When these brands and chemicals were duly registered the samples were analyzed and reported with other brands.

During the year four actions were brought and terminated for selling and having in possession to sell fertilizers which were not registered. Fines amounting to \$75.00 were recovered and paid into the State Treasury.

During the year one thousand eight hundred thirty-four brands and chemicals were registered with the Department. Fees amounting to \$32,495.00 were received by the office and turned into the State Treasury.

Returns of fertilizers sold in Pennsylvania during 1914 show that an aggregate of three hundred twenty-three thousand one hundred forty-eight tons were consumed. These figures are not complete. To this amount should be added certain inter-state sales, i. e. fertilizers that are purchased in adjoining states and carted into this State by parties living near border lines, also fertilizers ordered by Pennsylvania consumers direct from non-resident manufacturers and vendors who do not have the same registered for sale in this State and without the manufacturers or their representatives soliciting said orders, upon all of which no returns are made.

The remaining omissions are covered by delinquents who have failed to make a legal return to the Department.

The uneasiness of the fertilizer market, caused by the foreign war, first diminishing the supply of potash salts and finally cutting off the supply completely, brought about an unusual experience for both the manufacturer and consumer.

The Department realizing the importance of conserving such supply as was available in this country, took the initiative and permitted manufacturers to reduce their guarantees for potash without obliging them to re-register such amended brands, notice to be given of such reduction, on tags attached to the fertilizer bags.

Many manufacturers took advantage of this privilege, while others fearing complications of amending registered trade-names, discontinued the sale of brands running high in potash, and substituted

new brands for registration, which, in a measure, accounts for the disproportionate increase in registration fees during the year.

During the year covered by the present report, the Department has increased the scope of its fertilizer examinations with respect to a point of great interest to the fertilizer user—the quality of the nitrogenous ingredients in commercial fertilizers. It has, for a number of years, been a matter of common knowledge that many fertilizer manufacturers have been buying not only such nitrogenous materials as are either directly available to the plant, or capable of prompt conversion to a condition of availability in the soil, but also large quantities of hair, hoof, leather, wool waste, peat and garbage tankage, which hold their nitrogen in combinations which the plants cannot directly consume, and which are broken down to available condition in the soil with exceeding slowness. For the substances of the latter group, most of them manufacturing wastes, the fertilizer manufacturer pays a relatively low price, while the cost of a pound of nitrogen in the substances of the better group is three to four times as great as the cost of a pound of potash or of phosphoric acid in forms of the highest availability. The method of analysis which the Department has, for reasons of economy, heretofore required, fails to distinguish the percentages contributed by these different groups of ingredients.

To enable buyers to distinguish goods containing the lower grade of nitrogenous ingredients, the Fertilizer Law was amended in 1909, so as to require a declaration upon the fertilizer package when leather, hoof, horn, hair or wool waste is present in any form. A microscopic examination of the fertilizers was provided to discover these materials, if present. In no instance, however, has any package found by the official sampling agents borne the required declaration, nor has the microscope in any case shown any of the specified materials to be present with the exception of minute quantities of hair which might normally occur in animal tankage, a high-grade ingredient.

The use, however, of these low-grade nitrogenous materials by fertilizer manufacturers continues, as a matter of common knowledge. Indeed, the manufacturers admit that such use is general; but that these substances are so treated that they do not occur in the finished fertilizers, but only their derivatives formed by the action of strong acid upon them. For these derivatives, high plant food value is claimed. The claim is, so far as the derivatives of the animal materials mentioned in Section 4, of the Fertilizer Act of 1909, are concerned, but not with respect to those from peat and garbage tankage, is supported by the results of investigations made by Dr. William Frear, Chemist to the Department, at the Pennsylvania Agricultural Experiment Station, and by Dr. Hartwell and his colleagues at the Rhode Island Experiment Station.

The fourth section of the Fertilizer Act of 1909 does not specifically include derivatives from these low grade animal materials, in its declaration requirements. In view, however, of the relatively low cost of these materials, and also of the low cost of the treatment they undergo in the manufacture of the fertilizer containing their derivatives, the buying public continues to demand information of their presence, as a means of gauging the fairness of the prices charged for the goods, a matter quite independent of their agricultural values.

To meet the demand for such information, as expressed in resolutions adopted by the State Board of Agriculture, the most practicable way has seemed to be the application of a chemical method recently devised for the purpose. The principle of this method is set forth in the following paragraphs prepared at the request of the department by Dr. William Frear, Chemist to the Pennsylvania Agricultural Experiment Station, by whom the analysis of fertilizers is made.

"When a fertilizer is extracted by water, its most immediately available nitrogenous substances are removed. Water dissolves the nitrates, sulphate of ammonia, more or less of the nitrogen of the high grade organic materials, such as dried blood, most of the nitrogen of cyanamid, and a portion of the nitrogen from wet-mixed or acid-treated hair, leather, wool-waste, etc., but very little, if any, from the low grade materials last named, when present in unacidulated state.

"When dried blood, animal tankage, and fine ground bone are left in contact with field soil, the soil organisms quite rapidly transform most of the nitrogenous material over into ammonia and nitric acid. The same changes freely occur when properly acidulated leather, hair or wool-waste is exposed in the soil to the action of these organisms. Whereas, the action of the soil organisms upon the hair, raw or rotted, wool-waste and leather, raw, steamed or roasted, is very slow.

"The members of the Association of Official Agricultural Chemists of North America have, for years, been trying to find a chemical method by which, in the course of an hour or two, the degree of activity of the soil organisms upon these substances during a growing season is paralleled. Among the methods tried is that proposed by Prof. C. H. Jones, of the Vermont Agricultural Experiment Station. The New England and New Jersey Experiment Stations have adopted this method for use in their several states. The method depends upon the fact that under certain definite conditions of analytical procedure, alkaline potassium permanganate much more largely decomposes the water-soluble portions of the nitrogenous materials of dried blood, animal tankage, fish, horn meal, and the like, than it does the water-insoluble materials of hair, wool-waste, hoof parings, leather, peat and garbage tankage. The nitrogen is split off in the form of ammonia, which may be recovered by distillation and its quantity determined. The significant fact is not the quantity of ammonia thus formed, for this differs greatly among highly available materials; but the proportion which the quantity of nitrogen is the residual resistant material bears to the total water-insoluble nitrogen. The difference of this kind are well shown in analyses recently published by Jones.*

*Jour. Industrial and Engineering Chemistry, 4 (1912), 422-441.

Substance	Nitrogen (Per Cent.)				Percentage of water-insoluble resistant to permanganate	Available
	Total	Water soluble	Water—Insoluble			
			Active	Inactive		
1. Dried blood,	14.14	.31	9.82	4.01	29.0	10.13
2. High grade tankage,	10.06	3.87	4.23	1.93	31.1	8.15
3. Fish,	10.29	.48	7.26	2.36	24.4	7.74
4. Hoof-meal,	14.80	1.08	9.47	4.25	31.0	10.55
5. Base goods (wet mix),	1.83	1.23	.21	.34	61.8	1.49
6. Cottonseed meal,	7.02	.63	4.09	2.30	36.0	4.72
7. Castor pomace,	5.23	.88	2.55	1.85	42.0	3.43
8. Medium tankage,	5.65	1.19	2.85	1.61	36.1	4.04
9. Bone meal,	3.66	.59	1.39	.63	32.8	1.93
10. Treated leather,	6.54	.90	2.83	2.76	49.0	3.78
11. Charred leather,	1.02	.11	.12	.79	86.8	.23
12. Garbage tankage,	3.16	.37	.84	1.95	70.0	1.21
13. Peat,	3.09	.06	1.24	1.79	69.0	1.30
14. Mora meal,	2.69	.31	.75	1.60	68.1	1.06

“The behavior of mixtures of these materials with one another and with the ordinary minerals of fertilizers, gave results closely corresponding to those calculated from the facts for the nitrogenous ingredients when severally treated by this method.

“The fifth column of figures shows that, of the materials examined, sixty per cent. or more of the water-insoluble nitrogen was active in dried blood, tankages (high and low-grade), fish, hoof-meal (fine), cottonseed meal and bone meal; from forty-two (42) to sixty (60) per cent., in castor pomace and treated leather; less than forty-two (42) per cent. in peat, wet-mixed base goods of ordinary composition, mora meal, garbage tankage and charred leather. The behavior of the water-insoluble nitrogen of cyanamid has been studied by Mr. Cathcart, of the New Jersey Experiment Station, and found to be highly resistant to the alkaline permanganate, less than one-fifth being ‘active.’

“For the sake of condensing as much as practicable the more important facts of composition in the tables of fertilizer analyses, published by the Department, the results for nitrogen are reported under the headings, water-soluble, available, inactive insoluble and total. To the figures in the ‘inactive insoluble’ column is affixed the letters ‘a,’ ‘b’ on ‘c,’ according to the quality of the insoluble material, ‘a’ representing good, ‘b’ medium, and ‘c’ poor or low-grade material.

“It is needful to keep clearly in mind the meaning of the index ‘c’ as thus applied. Its presence does not suffice to indicate that the fertilizer contains no readily available nitrogen, but merely that part or all of the insoluble nitrogen is derived from low grade sources, barring cases in which cyanamid is one of the fertilizer ingredients. These low grade materials may be such as are listed in Section 4 of the law, or others in common use, such as garbage tankage, peat or mora meal; and they may be, if of animal origin, have had their nitrogenous materials changed almost entirely to an available condition by ‘wet mixing,’ which has, however, little improving effect upon the nitrogenous constituents of garbage tankage or mora meal, and little upon those of peat.

"The use of such low grade materials is either to make the fertilizer less likely to become sticky or lumpy, or to supply nitrogen from materials that would otherwise be wholly thrown to waste. The use of 'conditioners' for the former purpose is, in itself, desirable rather than objectionable; but becomes obnoxious and unjust when the nitrogen they contain in unavailable form is made the basis of a charge at high rates to the buyer. The use also of low grade and therefore cheap nitrogen supplies whose nitrogen has, by chemical treatment, been made useful for plant food, is laudable provided the materials are sold for what they are, instead of being sold at the prices of the nitrogen in high grade nitrogenous ingredients.

"In cases where the inactive insoluble nitrogen forms a large fraction of the total nitrogen, is marked by the index 'c,' the guaranty does not exceed the available nitrogen by an amount equal to most of the 'inactive,' and the selling price, corrected for freight difference, is not considerably less than that asked for fertilizers of like general composition but supplying nitrogen derived from high grade goods, such as bear the index 'a' or even 'b,' there is reason to believe that the buyer is subjected to unfair treatment.

"Section 1 of the Fertilizer Law of 1909 requires that the guaranty for a fertilizer shall state 'the percentage such fertilizer contains of nitrogen in an available form.' It is however, by no means clear that the term 'available,' as used in the law, means precisely that same thing that is meant by that term when used to designate the sum of the water-soluble and active insoluble nitrogen, as determined by the present method. For some nitrogenous fertilizer ingredients always regarded as of high grade, such as dried blood, meat tankage, and cottonseed meal, contains considerable fractions of inactive insoluble nitrogen when examined by this method. Until further notice, therefore, the law will not be construed to require that the amount of nitrogen guaranteed shall not exceed that present in a form that will appear as 'available' by the alkaline permanganate method now in use."

For lack of funds the department has not been able to cover the entire State in the fertilizer sampling work.

The fact that one thousand eight hundred thirty-four brands were registered and only one thousand one hundred ninety-four found and sampled by the agents of the Department, shows conclusively that more time than four weeks in the spring and a like period in the fall should be devoted to this work. The State having been divided into fifteen districts, with an average of four counties to each agent to be covered in this limited period, results in fertilizers being received by consumers before the arrival and after the departure of the agents, and carted to points which the agents can not reach without interfering with his itinerary.

When it is realized that but one sample is secured for each one hundred tons of fertilizer shipped into this State, and further, that more than six hundred registered brands and chemicals are not located, it is evident that the field force should be increased and the State re-districted so that each agent can give more attention to the consumers' receiving stations of his district, also allow him more time to follow railroads, also to detect violations of the laws and apprehend the offenders.

A more thorough canvass will prevent the appearance upon our market of so many unregistered brands, which brands are not found by the agents under the limitations to which the Department is subject. This statement is corroborated by the facts, that after each sampling period large numbers of brands and chemicals are reported which were sold in violation of the law, as referred to in another part of this report.

It is important that provision for taking more samples be made, which can only be done by extending the period for sampling work, at least along the lines of railroads over which past experience shows that a specially large amount of fertilizers are shipped. Such extension of the work could be so directed as to lead to the discovery of many brands the registration of which has been either evaded or overlooked by manufacturers, thereby increasing the revenue for reimbursing the State Treasury for the cost of the work, as well as securing greater protection to the farmers of the State.

Respectfully submitted,

H. E. KLUGH,
Clerk of Fertilizer Control.

REPORT OF THE BUREAU OF CHEMISTRY, FOR THE YEAR 1914

The work performed by the Bureau of Chemistry during the year 1914 has consisted of performing the chemical and microscopical work and the administrative duties necessary, under the direction of the Secretary of Agriculture, in carrying out the provisions of the Acts of Assembly which regulate the sale of Feeding Stuffs, Linseed Oil and Seeds.

The major portion of the work has been that of regulating the sale of Feeding Stuffs made necessary by the larger appropriation available for protecting the consumers of this commodity from purchasing misbranded, inferior or adulterated feeds. Special Agents of the Department visited 327 towns and cities in 61 counties of the State and secured from dealers 1300 official samples of Feeding Stuffs. In a number of communities visited samples were not taken for the reason that it was deemed inadvisable to duplicate the work or take too many brands of the same feed where it has been found these particular brands were properly labeled and guaranteed in accordance with the requirements of the Law.

These samples were sent to the Bureau in sealed bottles and were analyzed chemically and examined microscopically as to their chemical composition and for the ingredients claimed in each case, or for possible foreign, deleterious or prohibited materials. Accompanying these samples were reports of the Agents giving the information found on sacks or attached cards. Reports of the results of examinations were submitted to the Secretary of Agriculture and also sent out to the Dealers from whom each sample was taken and to the firms responsible for their manufacture or preparation. From time to time as these reports were submitted to the Secretary of Agriculture, they were carefully considered where violations were found to exist and in those cases where it was thought an attempt to defraud the purchasers had occurred, prosecutions were ordered.

It was found necessary to direct prosecutions to be made in 13 cases on samples which were received in 1914. These violations consisted for the most part of false guarantees for crude protein, fat or fiber, and for the presence of foreign or prohibited materials, such as weed seeds. Twelve of these cases were adjusted by payment of fines, only a small number of hearings being held, which amounted to \$600.00, this amount being immediately, after being received, paid to the State Treasurer in the usual manner. One of these cases was not pressed for a hearing for the reason that the evidence at hand did not warrant such action being taken. In a number of instances where minor violations were found to occur, especially in regard to labeling, no action was taken by the Department for the reason that the parties concerned showed a willingness to make the necessary corrections in order to comply with the requirements of the Law. In a few of these cases, where there was a slight variation in the content of crude protein found, as compared with that guaranteed

in Cottonseed Meals, the Dealers were reimbursed by the Manufacturers on the basis of 50c per unit for each ton of Cottonseed Meal purchased. During the year, 9 cases were adjusted by payment of fines where prosecutions had been ordered in 1913 samples, amounting to \$450.00. The amount of fines received and paid to the State Treasurer, therefore, during the period covered by this report was \$1,050.00. The number of prosecutions ordered during the year was about one-half the number ordered during the previous year which is an indication that the violations are becoming less and less as the work of enforcing the law and educating the Dealers in Feeding Stuffs as to the requirements of the Law, continues. One of the cases adjusted by payment of fine was the one referred to in our previous report as still pending which had been returned to Court by the Magistrate. The defendant plead guilty before the Court without the necessity of a trial and paid the fine imposed by the Judge.

The character of the Feeding Stuffs now being sold in the State as judged from the samples examined during 1914, shows a continued improvement as to branding, labeling and their freedom from undesirable by-products. The matter of weed seeds in Chicken Feeds has continued to give us some trouble but the number of violations in this respect are continually decreasing. One large manufacturer of Feeding Stuffs, after considerable controversy and a lengthy hearing with the Department Officials, finally agreed to eliminate weed seeds from their products sold in the State without causing this controversy to be adjusted by means of a lengthy court trial. The promise of this concern to comply with the requirements of the Law in selling clean Poultry Feeds in the State is, therefore, highly pleasing as it will make the number of prosecutions less and will also obviate the necessity of continually securing samples of these brands of feeds, making exhaustive tests on such samples and being continually on the watch for weed seeds in these particular brands.

During the year 236 special samples of Feeding Stuffs were sent to the Department for analysis, as provided for by the Feeding Stuffs Law. These samples were all analyzed for protein, fat and fiber and results reported to the senders as soon as possible. In many cases inquiries in regard to labeling and guaranteeing accompanied these samples and directions were given in such cases as to the requirements of the Law. The amount of fees for the analysis of special samples received was \$235.00, which was paid to the State Treasurer in the usual manner, from time to time, as they were received. One sample was received and analyzed, for which no fee was received, as the sender refused to remit the amount of charge after having requested that the analysis be made. In this case no report was made.

Early in the year a Bulletin of 189 pages was prepared covering the work done during 1913. These Bulletins were sent to approximately 6000 Manufacturers of and Dealers in Feeding Stuffs and others interested in the work whose names appear on our mailing list. The usual number of registrations were also received during the latter part of 1913 and the first few weeks in 1914, listing the various brands of feeds which were to be offered for sale in the Commonwealth. All these registrations were carefully looked over and in quite a number of cases requests were made for samples to be sub-

mitted for examination before registrations were accepted. In a number of these cases where the character of the feed did not meet the standards required by the law, registrations were refused. In a number of other cases registrations were returned with requests for corrections, as the method of guaranteeing and labeling the brands listed thereon were incorrect. It has not been the custom of the Department to analyze chemically and examine microscopically a sample of each brand of Feeding Stuffs, registrations for which are filed with the Department, however, wherever the method of guaranteeing and the list of ingredients given appeared to be misleading or in doubt, samples were requested for examination. As previously stated, in several cases, Chicken Feeds were listed, which, upon examination of samples, were found to contain large quantities of unground weed seeds and accordingly registrations were refused for these brands.

It has been the custom to make a few check analyses from time to time to compare our work with that being done by other Chemists and the number of such samples examined, together with the samples examined for registrations and those sent in and examined by special request where illness was thought to have occurred, amounted to 104. Of this number there were 21 samples of Cottonseed Meal and 21 samples of Cotton Seed analyzed for the Feeding Stuffs Control Committee, of which the Chief Chemist is a member, in investigating the character of the Cotton Seed Meals being offered for sale. A report of the results obtained on these samples were made to the Committee and as a result of the work accomplished by all the members of this Committee, recommendation was made to continue the study of this problem for another year. It is expected, therefore, that it will be necessary to analyze about this number of Cottonseed Meals during the coming season. The investigation of the composition of Cottonseed Meals is being made in an attempt to determine whether or not it would be advisable to establish a crude fiber standard for this by-product feed. From the results already at hand no conclusion could be drawn as to whether or not there should be such a standard. In order to further investigate this matter the Chief Chemist of the Department visited a number of oil mills in the South for the purpose of obtaining what information could be had as to the amount of Cottonseed Hulls or fibrous material left in the cake after the extraction of oil from the cotton seed. This information, together with the results of the analysis of additional samples of Cottonseed Meals, will be reported to the Committee at the next meeting of the Association of Feeding Stuffs Control Officials. From what has already been observed on this subject, it would seem that in selling Cottonseed Meal there should only be one guarantee for crude protein, instead of the usual sliding guarantee ranging from 38.62% to 43.00%, and these guarantees maintained by the Manufacturers. If this practice were followed out, considerable misunderstanding and controversy would be remedied which might probably make it unnecessary to have two standards, such as a protein standard and a fiber standard for Cottonseed Meal.

During the year the number of official samples of Linseed Oil obtained by Special Agents of the Department and analyzed was 250. The work necessary in analyzing Linseed Oil is an expensive operation and owing to this fact, and the amount of money avail-

able for carrying on this work, it was deemed inadvisable to obtain a larger number of samples. The results of this analytical work, together with the information furnished by the Agents and which accompanied each sample, were reported to the Secretary of Agriculture and to the Dealers from whom the samples were taken and to the Manufacturers or Importers where known. Eight of these samples were found to be adulterated with varying quantities of heavy or light Mineral Oil, and prosecutions were ordered in 7 cases. The remaining case is being considered and action will be taken against the Importer, or party responsible for its sale in the State, if the results of an investigation now being made warrants this procedure. All but two of the cases ordered have been adjusted, without hearing before the Magistrate, by payment of fines, amounting to \$250.00, which was paid to the State Treasurer, as they were received. One case is still pending and advice has been received that the other will be adjusted satisfactory to the Department. Eight samples of Linseed Oil were found to contain turpentine and no action was taken against the dealers in these cases for the reason that it was evident from the testimony of the dealers and Special Agent, these Oils had become accidentally contaminated. There appears to be a few firms who still persist in selling adulterated Linseed Oil and it is hoped that as the investigation work continues, this form of fraud will be stopped. The new Linseed Oil Law, under which we are working at the present time, and which was passed by the Legislature at its last session, has proved to be very effective for the reason that standards of purity were established by this Act. The results of analysis obtained upon the samples thus far received show that these standards are reasonable, as Pure Raw and Boiled Linseed Oil will come within the requirements of the Law, while samples which are found to contain small quantities of Foreign Oils will fall outside of these standards. A Bulletin will be prepared covering the work accomplished during the year in enforcing the Linseed Oil Law and showing to what extent Linseed Oil is being adulterated, which will be sent out to those interested in this line of work. There were only four special samples of Linseed Oil sent to the Department to be analyzed as provided by the Law with the fee of \$1.00 which is required to be charged. This amount of money was paid to the State Treasurer.

The year 1914 has seen the enforcement of Pennsylvania's first Pure Seed Law, which was also enacted by the Legislature at its last session, becoming effective January 1, 1914. The work of making purity tests on samples of seeds in carrying out the provisions of this Act, has been performed in the Chemical Laboratory of the Department. Before the law became operative, the necessary seed testing and other apparatus of the best type were installed and every preparation made to do the work in a thorough and satisfactory manner. The Department now has, in addition to this equipment, a valuable collection of seeds for comparison and it is felt we are fully prepared to do careful and accurate work. During the year Special Agents of the Department secured from Seed Dealers throughout the State, 202 official samples of seeds. These samples were placed in specially prepared envelopes and either brought or sent to the Department to be tested. The Seed Law provides, in addition to the securing of official samples for testing, that Seed

Dealers or Growers located in the State may send samples of seeds to the Department to be tested for the fee of 25c per sample. The number of such special samples sent in to be tested for purity, together with the fee charged, was 376, making a total of 578 samples of Seeds which were tested for purity during the year. This work is necessarily tedious and must be carried out in a very careful manner, and because of the large number of special samples received, it was not thought advisable for the Special Agents to secure a larger number of official samples. It is felt by the Department, from the work already accomplished, that the Seed Law has been of great benefit to the farmers and seedsmen of the State, as it has enabled them without much trouble to learn the quality of the seeds covered by the Law, for a small fee. The results of tests for purity made on the official samples show that the quality of seeds being sold in the State, as judged from these samples, are well above the standards of purity set forth in the Law. The same conclusion can also be drawn from the results obtained on the 376 special samples tested during the year. Of the number of official samples received, 15 kinds of Seeds covered by the Law, were represented, and in every case the average of these tests for purity were above the standard for each kind of Seed. Both official and special samples consisted mostly of Red Clover, Alsike Clover, Alfalfa and Timothy Grass Seed.

A Bulletin is in the course of preparation which will give in detail the results of all the work accomplished in carrying out the provisions of the Seed Law. There is no doubt in the minds of the officials in charge of the enforcement of the Seed Law that it will work a great benefit to farmers and seed dealers throughout the State, and will tend to raise the character or quality of the seeds offered for sale. The fact that samples of seeds can be tested for purity for a small fee will make it easy for those interested to determine whether or not the seeds which are being sold or offered for sale will meet the standards set forth in the Law and also will give an index to as their quality.

Officials of the Department attended the annual meeting of the Association of Feed Control Officials, held in November and took part in the discussions. The meetings held by this body of State Officials of the various states, engaged in Feeding Stuffs work, are a source of valuable information. Definitions have been adopted for nearly every product used for feeding purposes, and a better understanding of the many brands of feeds and their source of preparation, has resulted from these meetings.

The amount of money appropriated for the two fiscal years, June 1st, 1913, to May 31st, 1915, for carrying out the provisions of the Feeding Stuffs, Linseed Oil and Seed Laws was as follows: —

Feeding Stuffs,	\$30,000.00
Linseed Oil,	4,500.00
Seeds,	4,000.00

The amount of money expended to December 31st, 1914, out of these funds were as follows:

Feeding Stuffs,	\$20,722.39
Linseed Oil,	2,686.11
Seed,	1,659.29

The general office work of the Bureau has increased over that of last year owing to the work necessary in carrying out the provisions of the Seed Law, and it was found necessary to employ an extra clerk, who has been taught to assist in the seed testing work. All the members of the Bureau Staff have shown a splendid interest and enthusiasm in performing the work which they have been called upon to do, and great credit should be given to them in making possible the completion of the year's work in a highly satisfactory manner.

Respectfully submitted,

JAMES W. KELLOGG,
Chief Chemist.

REPORT OF THE BUREAU OF STATISTICS

Harrisburg, Pa., January 1, 1915.

Hon. N. B. Critchfield, *Secretary of Agriculture*:

Dear Sir:—I have the honor to submit herewith a report of the Bureau of Statistics of the Department of Agriculture for the year ending December 31, 1914.

INTRODUCTORY REMARKS

It will be observed that this Bureau is now only a little more than a year old. Much of our work during the year has been of a preliminary character. The early part of the year was almost entirely consumed in completing an enumeration of the farmers of the State. While this caused work and consumed time, it is a valuable asset and permits the Department to reach the farmers in every section of the State.

Considering that the Bureau is yet in its infancy and our office force small, we think we have made a good start, and with proper effort, we hope to improve its efficiency and usefulness.

ABANDONED AND UNOCCUPIED FARMS

Owing to the fact that much has been said and written about abandoned and unoccupied farms in Pennsylvania; and many inquiries coming to the Department for information concerning this class of farms, we determined to prepare and publish a bulletin giving this information to the public, providing, the owners of such farms desired to sell the same and would furnish us a descriptive application.

We had a notice to this effect inserted as a news item in nearly all the newspapers of the State. We only received a little over a hundred applications and these were of unoccupied farms. It is safe to say that Pennsylvania has no abandoned farms.

The bulletin was given to the public during the summer and we are pleased to report that we have had many applications for copies of it as well as notices of a number of sales.

My thought is that we should follow the example of our neighboring states and publish a bulletin, during the coming year, not only of unoccupied farms, but of all classes of cheap farms that are for sale. We believe this will be time and money well spent and will improve the efficiency of the farmers of the State, and result in the occupation of many of these farms by persons who will turn their energy toward helping to meet the demand of our people for food supplies in a more substantial way than is being done by the present occupants.

CREAMERIES, CHEESE FACTORIES, MILK CONDENSERIES AND
CANNERIES

To meet a demand for information relative to creameries, cheese factories, milk condenseries and canneries, this Bureau made diligent inquiry in every county, borough and city in the State, through the Assessors and otherwise. We have collected what is generally considered fairly correct lists. These lists have been recently published in bulletin form under the supervision of the Dairy and Food Commissioner and are now ready for distribution.

SHEEP KILLED AND INJURED BY DOGS

It has been a well known fact all these years that the dogs have been detrimental to the sheep industry of this State, but, so far as we know, no systematic effort has ever been made to collect this data to ascertain just how much the damage has been for any one year. Through the County Commissioners' offices, we secured the necessary information for the year 1913 which is tabulated and submitted herewith in detail and made a part of this report. I desire to add that from estimates just received from our correspondents, there are only seventy per cent. of the number of sheep in this State at the present time that there were ten years ago. It is very evident that we need additional legislation to protect this important but fast declining industry from the ravages of the dogs.

SHEEP KILLED AND INJURED BY DOGS, AMOUNT OF DAMAGES PAID, DOG TAX COLLECTED, HOW EXPENDED, ETC., IN PENNSYLVANIA, BY COUNTIES, FOR THE YEAR 1913. COLLECTED AND COMPILED BY L. H. WIBLE, STATISTICIAN, DEPARTMENT OF AGRICULTURE

Counties	Sheep killed	Sheep injured	Average price paid for sheep killed	Average price paid for sheep injured	Amount paid for sheep killed and injured, including costs	Amount of tax levied for each male dog	Amount of tax levied for each female dog	Amount of dog tax collected	Number of dogs killed by direction of the County Commissioners and tax collectors	Amount expended for the killing of dogs by constables and borough policemen	Amount expended for the payment of horses, etc., bitten by mad dogs	Amount expended for dog tags
Adams,	6	.....	\$4 94	.....	\$54 15	\$0.50	\$1 00	\$1,700 00	.....	.....	.....	\$28 70
Allegheny,	98	36	5 00	.....	739 50	1 00	2 00	11,709 55	553	.....	.....	97 00
Armstrong,	116	117	.....	\$2.66	1,368 10	1 00	2 00	3,150 00	63	.....	.....	50 00
Beaver,	195	124	4 26	.....	1,119 00	1 00	2 00	3,149 95	13	.....	.....	82 25
Bedford,	183	136	4 97	2 59	1,535 95	1 75	1 50	3,132 50	3	.....	101 00	51 75
Berks, .....	.....	.....	.....	.....	.....	50	1 50	4,971 50	50	109 00	.....	96 00
Blair,	55	43	7 30	3 30	543 50	50	1 00	1,280 95	1	.....	.....	36 00
Bradford,	360	200	5 00	2 21	2,242 75	1 00	2 00	3,925 00	18	18 00	.....	46 00
Bucks,	1	1	7 00	8 00	17 50	1 50	1 00	3,282 00	16	16 00	.....	63 00
Butler,	151	120	5 30	2 85	1,441 75	1 00	2 00	3,600 00	5	.....	113 50	43 75
Cambria,	93	61	6 70	3 79	1,046 65	1 00	2 00	3,341 00	26	24 00	35 00	38 00
Cameron,	6	.....	5 00	.....	60 00	1 50	75	305 25	.....	.....	.....	6 00
Carbon, .....	.....	.....	.....	.....	.....	50	50	345 09	.....	.....	.....	37 50
Centre,	63	40	5 81	2 14	648 00	50	1 00	1,865 00	.....	4 00	.....	38 00
Chester,	18	7	6 27	.....	125 25	50	50	579 50	.....	40 00	.....	26 40
Clarion,	47	48	6 75	3 95	637 90	50	1 00	975 78	9	9 00	.....	4 00
Clearfield,	27	.....	6 00	.....	274 50	1 00	2 00	2,086 49	2	24 00	273 00	51 27
Clinton,	4	.....	7 23	.....	40 00	50	1 00	535 25	.....	.....	.....	25 25
Columbia, .....	.....	.....	.....	.....	.....	.....	.....	537 03	1	1 00	69 62	35 00
Crawford,	485	.....	5 87	.....	3,137 00	1 00	2 00	4,543 00	.....	.....	.....	.....
Cumberland,	137	56	6 00	3 00	990 00	25	25	1,654 75	9	9 00	228 00	52 25
Dauphin,	1	.....	10 00	.....	14 50	25	50	956 30	16	16 75	.....	60 00
Delaware,	21	.....	12 72	.....	267 25	1 00	1 00	3,770 65	.....	.....	41 25	77 00
Elk,	3	1	5 00	2 00	24 00	.....	.....	794 00	18	18 00	.....	33 00

SHEEP KILLED AND INJURED BY DOGS. AMOUNT OF DAMAGES PAID, DOG TAX COLLECTED, HOW EXPENDED, ETC.,
IN PENNSYLVANIA. BY COUNTIES, FOR THE YEAR 1913. COLLECTED AND COMPILED BY L. H. WIBLE, STATIS-
TICIAN, DEPARTMENT OF AGRICULTURE—Continued

Counties	Sheep killed	Sheep injured	Average price paid for sheep killed	Average price paid for sheep injured	Amount paid for sheep killed and injured, including costs	Amount of tax levied for each male dog	Amount of tax levied for each male dog	Amount of dog tax collected	Number of dogs killed by direction of the County Commissioners and tax collectors	Amount expended for the killing of dogs by constables and borough policemen	Amount expended for the payment of horses, etc., bitten by mad dogs	Amount expended for dog tags
Erie,	244	144	7 30	3 28	2,355 50	1 00	2 00	5,578 28	50	50 00	.....	79 20
Fayette,	239	117	4 58	2 31	1,590 25	1 00	.....	3,804 39	.....	.....	.....	76 33
Forest,	2	4	5 50	4 25	41 00	1 00	2 00	701 00	.....	.....	.....	11 00
Franklin,	86	85	4 19	2 10	735 00	35	35	1,420 66	.....	8 00	.....	33 75
Fulton,	33	20	5 59	1 97	279 90	25	50	319 16	.....	1 00	.....	16 10
Greene,	478	416	4 22	1 58	3,575 02	1 50	2 50	3,724 50	23	23 00	32 75	30 00
Huntingdon,	73	32	4 87	3 00	543 05	75	1 00	863 00	.....	72 00	101 50	35 00
Indiana,	297	154	6 12	3 16	2,423 50	1 50	3 00	3,799 00	72	154 00	.....	51 75
Jefferson,	22	68	8 00	4 03	450 00	1 00	2 00	2,236 79	154	.....	.....	55 00
Juniata,	14	4	6 55	2 10	135 10	35	50	427 40	.....	.....	.....	20 50
Lackawanna,	37	5	7 10	2 20	326 50	1 00	2 00	2,105 00	4	.....	167 00	33 75
Lancaster,	11	5	6 37	.....	102 00	50	1 00	3,320 00	.....	4 00	.....	61 25
Lawrence,	159	222	6 20	3 09	1,671 78	1 00	3 00	3,431 74	.....	98 00	.....	42 00
Lebanon, .....	.....	.....	.....	.....	.....	50	1 00	556 54	21	21 00	.....	51 75
Lehigh, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Luzerne,	42	9	7 15	3 18	395 50	40	40	1,771 61	7	7 00	100 00	135 00
Lycoming,	35	17	10 00	5 00	443 50	50	1 00	1,882 00	6	6 00	.....	45 00
McKean,	97	35	6 00	3 00	868 50	1 00	3 00	2,485 00	111	111 00	.....	36 00
Mercer,	349	742	5 50	1 87	3,721 95	2 00	4 00	5,353 50	17	17 00	.....	36 00
Mifflin,	5	20	7 10	2 55	111 00	.....	.....	552 18	.....	.....	.....	15 00
Monroe,	14	9	5 46	2 44	113 50	50	1 00	969 54	2	2 00	.....	26 25
Montgomery,	10	78	11 27	5 52	153 25	50	2 00	4,166 50	.....	.....	.....	81 00
Montour, .....	.....	.....	.....	.....	.....	.....	.....	539 00	.....	.....	.....	16 80
Northampton,	4	5	8 00	75	49 00	25	1 00	1,025 00	4	4 00	.....	63 00

County	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Northumberland,	10	14	151 25	50	1 00	1,009 85	210 50	55 00					
Perry,	5			20	50	553 00		29 20					
Philadelphia,	175			25	1 00			18 00					
Pike,				50				27 50					
Potter,	60		50 25	50	1 00	376 00		94 50					
Schuylkill,		3 00	1,190 00	50	1 00	1,200 00	25 00	22 05					
Snyder,				50	50	2,343 87	43 00	47 25					
Somerset,				15	50	276 30		21 00					
Somerset,	203			1 00	4 00	3,707 91	91						
Sullivan,	50		1,742 10	50	1 00	454 70							
Susquehanna,*	35		518 00	50	1 00								
Tioga,	237		2,192 93	1 00	2 00	3,380 00	3 00						
Union,				25	50	206 04							
Venango,	107		1,356 00	50		2,410 00	3 10						
Warren,	307		5,960 20	1 50	3 00	1,114 36							
Washington,	793		1,784 25	100	2 00	4,975 50	385 00						
Wayne,	179		700 50	1 00	2 00	2,226 00	14 00						
Westmoreland,	188		185 50	25	3 00	6,354 06	61 50						
Wyoming,	52			1 00	3 00	1,307 58	10 00						
York,	23			25	50	1,818 00	128 25						
Total,	6,393	4,845	\$54,922 70			\$145,706 01	1,419	\$1,719 56	\$2,593 37	\$2,818 31			
Average,					\$1 44								

*Under a special act, each township and borough in Susquehanna County collects its own dog tax and pays its own damages. The data from that county is not included in the above statement.

It will be observed also that the above statement only relates to the dog tax collected in the townships and boroughs of the State.

CROP REPORTS

Starting with the month of October, this Bureau began the collecting and compiling of monthly crop reports. To prosecute this work effectively, we started out to secure a reporter or correspondent for each township in the State. We approached this matter with some fear because we were asking that this service be rendered gratuitously. However, I am pleased to report that up to the present time we have secured about eight-hundred reporters and are adding others to our corps from time to time. The persons that we have secured are well qualified as evidenced by the reports already filed. The detailed reports for the months of October and November as well as the annual report are submitted herewith and made a part of this report.

It is our intention to make crop reports monthly or nearly so during the year 1915. The information contained in these monthly reports will be used as the basis for our annual report relating to the crops.

REPORT OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE ON
THE CONDITION OF CROPS, OCTOBER 1, 1914

The following report is compiled from the returns received from the official correspondents of the Department:

Wheat—Estimated area harvested,	1,312,000 acres.
Wheat—Product per acre,	18.5 bushels.
Wheat—Total estimated product for 1914, ..	24,272,000 bushels.
Wheat—Quality compared with an average, ..	95 per cent.
Wheat—Crop of 1913 still in producers' hands,	4 per cent.
Wheat—Damage by the Hessian fly,	10 per cent.
Rye—Estimated area harvested,	280,000 acres.
Rye—Product per acre,	17 bushels.
Rye—Total estimated product for 1914,	4,760,000 bushels.
Rye—Quality compared with an average, ..	95 per cent.
Oats—Estimated area harvested,	1,073,000 acres.
Oats—Product per acre,	29 bushels.
Oats—Total estimated product for 1914,	31,117,000 bushels.
Oats—Quality compared with an average, .	90 per cent.
Corn—Prospect compared with a normal yield,	95 per cent.
Corn—Cut for ensilage,	10 per cent.
Corn—Damage by July storms,	5 per cent.
Potatoes—Probable total yield compared with last year,	90 per cent.
Tobacco—Prospect compared with an average yield,	95 per cent.
Pasture—Condition compared with an average,	85 per cent.
Apples—Prospect compared with last year, ..	150 per cent.

REVIEW OF CROP CONDITIONS, OCTOBER 1, 1914.

The estimated production of wheat in Pennsylvania for the year 1914 is 24,272,000 bushels, which is approximately 2,000,000 more bushels than the estimated production of one year ago; but it will

be observed that the acreage was slightly larger this year than last. It appears that the average increase in production this year over last is about one and one-half bushels per acre. The quality compared with an average is 95 per cent. The Hessian fly damaged the wheat considerably in certain sections of the State, particularly in Berks and Montgomery counties.

The estimated acreage of rye for 1914 harvest is 280,000 acres. The average production per acre is 17 bushels, and the total production 4,760,000 bushels. The acreage and production are about the same as 1913.

The acreage of oats for 1914 is estimated at 1,073,000 acres. This is about 81,000 acres less than harvested last year. The total crop is about 31,117,000 bushels. The average production per acre is about 29 bushels while last year it was 31 bushels per acre. The decrease in production is largely due to the unfavorable condition at the time of seeding and to the ravages of the army worm. The army worm damaged the crop more particularly in the northwestern counties.

Corn prospects indicate about 95 per cent. of a normal yield. Our reports show that the dry weather has materially affected the crop in many parts of the State, yet in other sections there is a very large crop. Further information will be given relative to the 1914 grain crops in our November and December reports.

Reports indicate that the potato crop will be about 90 per cent. of an average yield but is very poor in many counties.

Pasture is very poor due to the long drought which has prevailed in nearly every part of the State.

Our figures show that the apple crop is 150 per cent. of last year, but we do not claim that these figures are very satisfactory as in many counties there were no apples last year, and, of course, it would be impossible in those counties to make a comparison. However, the crop in 1913 was a very poor one while this year there is an abundant crop.

REPORT OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE ON THE PRODUCTION OF WHEAT, RYE, OATS
AND CORN AND THE CONDITION OF OTHER CROPS, OCTOBER 1, 1914

Counties	Number of reports filed	Wheat			Rye		Oats		Corn			Potatoes	Tobacco	Pastures	Apples	
		Products per acre	Quality compared with an average	Crop of 1913 still in producers hands	Damage by Hessian fly	Product per acre	Quality compared with an average	Product per acre	Quality compared with an average	Prospects compared with a normal yield	Cut for ensilage	Damage by July storms	Probable total yield compared with last year	Prospect compared with an average yield	Condition compared with an average	Prospects compared with last year
Adams,	7	Bus. 29	% 95	% 2	% 7	Bus. 19	% 94	Bus. 30	% 85	% 100	%	% 3	% 76	%	% 90	% 90
Allegheny,	17	18	95	4	2	17	92	26	75	90	8	4	90	90	85	93
Armstrong,	10	17	105	3	4	14	93	24	94	102	2	3	94	90	88	185
Beaver,	10	15	99	2	3	14	99	25	92	90	5	3	72	92	92	104
Bedford,	7	17	105	5	3	14	92	25	95	80	3	3	60	90	40	300
Berks,	23	15	75	8	30	19	90	33	95	110	8	.....	95	95	80	125
Blair,	8	18	98	2	3	15	92	30	85	85	3	2	50	90	60	150
Bradford,	6	21	95	4	3	17	92	26	75	80	7	8	95	95	95	97
Bucks,	13	18	85	.....	15	20	92	25	100	92	10	.....	105	90	60	90
Butler,	20	19	100	6	4	16	100	25	85	94	8	6	84	90	85	250
Cambria,	8	19	103	5	2	15	96	29	93	100	4	4	90	90	60	150
Cameron,	4	20	98	.....	.....	19	90	31	98	95	.....	.....	90	90	75	140
Carbon,	18	17	92	2	15	19	95	35	100	96	2	.....	100	90	60	110
Centre,	6	17	99	5	4	15	97	32	90	90	3	.....	76	90	50	115
Chester,	18	22	90	.....	15	20	91	38	92	115	10	.....	102	90	75	120
Clarion,	11	20	102	3	.....	15	103	30	90	96	6	7	110	93	110	175
Clearfield,	8	20	100	3	.....	17	93	29	80	98	8	2	110	90	65	200
Clinton,	9	19	94	.....	2	13	90	31	95	85	4	2	60	96	50	95
Columbia,	7	16	96	.....	12	13	96	32	94	97	3	.....	104	90	97	90
Crawford,	14	20	102	6	.....	16	100	27	80	98	.....	3	104	86	160	160
Cumberland,	11	20	97	2	9	18	99	29	80	110	5	6	75	94	100	94
Dauphin,	13	20	87	2	8	18	92	33	90	104	2	9	80	90	100	90
Delaware,	9	24	100	.....	.....	.....	.....	38	92	115	8	3	98	90	70	130
Elk,	5	19	100	.....	.....	19	100	32	92	82	3	4	110	82	300	300
Erie,	11	20	96	5	.....	18	92	23	65	86	25	.....	85	88	125	125
Fayette,	9	15	103	3	.....	15	99	27	90	86	4	6	95	68	400	400
Forest,	8	19	99	2	.....	17	97	23	82	89	.....	.....	78	84	60	200
Franklin,	10	20	100	4	7	18	97	25	90	83	4	.....	60	62	150	150
Fulton,	10	13	102	3	6	11	96	18	86	80	2	2	66	.....	50	.....

City	7	15	103	5	.....	11	90	25	95	88	.....	5	50	.....	52	300
Greene,	7	15	103	5	.....	11	90	25	95	88	.....	5	50	.....	52	300
Huntington,	6	15	97	.....	.....	12	97	24	92	86	.....	.....	65	.....	70	125
Indiana,	8	16	105	4	.....	16	98	24	88	105	.....	3	80	.....	82	180
Jefferson,	14	19	100	3	.....	11	90	25	96	99	.....	2	66	.....	87	200
Juniauta,	9	15	92	.....	.....	18	92	35	98	92	.....	10	95	.....	78	80
Lackawanna,	6	.....	.....	.....	.....	13	92	37	90	120	.....	3	103	104	90	150
Lawrence,	23	26	98	4	.....	16	103	26	94	90	.....	5	77	.....	92	180
Lebanon,	9	17	100	6	.....	19	95	33	92	115	.....	6	92	100	103	80
Lehigh,	4	20	100	.....	.....	19	93	35	95	92	.....	3	102	.....	75	225
Luzerne,	8	17	84	2	.....	15	92	29	94	94	.....	.....	92	.....	107	160
Lycening,	10	20	94	.....	.....	16	93	30	90	93	.....	7	88	90	76	92
McKean,	14	18	94	2	.....	.....	.....	23	85	86	.....	.....	96	.....	78	150
Mercer,	4	16	95	4	.....	19	104	24	85	105	.....	5	110	.....	108	220
Midlin,	17	21	104	4	.....	.....	.....	31	90	75	.....	4	70	.....	70	200
Monroe,	4	18	95	.....	.....	15	93	31	90	90	.....	.....	100	.....	90	150
Montgomery,	7	17	90	.....	.....	18	85	36	103	90	.....	8	100	.....	84	140
Montour,	17	13	80	.....	.....	21	95	31	95	105	.....	.....	85	.....	90	175
Northampton,	3	19	87	6	.....	17	100	35	105	115	.....	2	102	.....	96	110
Northumberland,	11	17	80	3	.....	20	90	36	98	88	.....	8	90	.....	106	170
Perry,	7	17	94	.....	.....	14	86	33	105	97	.....	6	82	.....	75	75
Philadelphia,	8	15	80	3	.....	15	96	30	93	90	.....	3	103	.....	65	88
Pike,	3	25	100	.....	.....	25	98	35	92	115	.....	.....	150	.....	90	140
Potter,	5	13	95	.....	.....	18	93	34	96	103	.....	.....	150	.....	102	175
Schuykill,	10	21	96	.....	.....	22	96	25	80	97	.....	8	115	.....	96	130
Snyder,	6	23	78	2	.....	20	87	30	92	97	.....	.....	93	.....	90	75
Somerset,	7	15	92	4	.....	16	100	32	97	110	.....	3	94	.....	70	215
Sullivan,	10	19	100	5	.....	17	97	31	93	81	.....	15	103	.....	120	150
Susquehanna,	4	26	100	.....	.....	20	100	30	90	100	.....	.....	110	.....	125	175
Tioga,	10	22	98	.....	.....	22	108	30	90	80	.....	.....	98	90	100	93
Union,	8	20	93	.....	.....	18	90	20	70	90	.....	.....	94	.....	80	60
Venango,	6	18	96	.....	.....	16	100	29	94	100	.....	4	94	.....	78	125
Warren,	9	18	100	5	.....	15	97	25	83	96	.....	.....	96	.....	98	130

REPORT OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE ON
THE CONDITION OF CROPS, NOVEMBER 1, 1914

The following report is compiled from the returns received from the official correspondents of the Department:

Wheat—Estimated area sown last fall,	1,312,000 acres
Wheat—Sown this fall compared with last year,	101 per cent.
Wheat—Estimated area seeded for harvest of 1915,	1,325,120 acres.
Wheat—Condition compared with an average,	94 per cent.
Wheat—Average date of seeding,	September 25.
Rye—Estimated area sown last fall,	280,000 acres.
Rye—Sown this fall compared with last year,	97 per cent.
Rye—Estimated area seeded for harvest of 1915,	271,600 acres.
Rye—Condition compared with an average,	94 per cent.
Corn—Prospect compared with an average yield,	99 per cent.
Buckwheat—Prospect compared with an average yield,	85 per cent.
Cloverseed—Prospect compared with an average yield,	80 per cent.
Potatoes—Estimated area planted,	268,000 acres.
Potatoes—Average product per acre,	106 bushels.
Potatoes—Total estimated production,	28,408,000 bushels.
Potatoes—Affected by rot,	6 per cent.
Hogs—Condition compared with an average,	98 per cent.
Hogs—Number to be fattened compared with 1913,	96 per cent.

REVIEW OF CROP CONDITIONS, NOVEMBER, 1, 1914

The months of August, September and October were unfavorable for crops in Pennsylvania. Our reports show that only one per cent. more wheat was sown this fall than last year. This would only increase the acreage about 13,120 acres. Because of the encouraging outlook for advanced prices in wheat, it was the intention and desire of the farmers of this State to sow a much larger area, but the long drought prevented plowing and putting the ground in proper condition for seeding. The wheat was sown very late this fall for two reasons, first, the ground could not be gotten in proper condition because of the drought, and, second, to evade the ravages of the Hessian fly. The average date for sowing wheat in this State was September 25. The average date for sowing in the northern tier of counties was September 16 and in the southern tier October 2.

The estimated acreage of rye sown for the harvest of 1915 is approximately three per cent. less than harvested last year. Two things served to keep the rye area nearly up to last year. One was the ground could not be gotten in order in time to seed to wheat, and rye was sown instead; and the other was, in sections where the fly was particularly bad last year in wheat, more rye was sown this year in lieu thereof.

Corn prospects are good. The estimated acreage planted is 1,463,000 acres. Our reports show approximately an average crop. The average crop for the years 1910-13, inclusive, was between forty-one and forty-two bushels of shelled corn per acre and we believe when our December reports, which will contain more definite information, are received, they will show a similar flattering production this year. Our reports show that the corn this year is well matured and is of splendid quality.

Buckwheat acreage was about the same as last year. The dry weather affected it materially and it appears that this year's crop is 85 per cent. of an average.

Cloverseed was not a good crop. Only about one-half the counties in the State report any production of cloverseed.

The estimated area planted in potatoes this year was 268,000 acres. Our reports show that there is an average production of 106 bushels per acre, which makes the total production 28,408,000 bushels. The average production last year was eighty-eight bushels per acre. The rot affected the crop to some extent this year, but very slightly in most of the counties.

The condition of hogs is a little lower than the average. Number fattening is 96 per cent. as compared with 1913.

REPORT OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE ON THE AREA AND CONDITION OF WHEAT AND RYE, AND THE PRODUCTION OF CORN, BUCKWHEAT, CLOVERSEED, POTATOES, ETC., NOVEMBER 1, 1914

Counties	Wheat			Rye		Corn	Buckwheat	Clover Seed	Potatoes		Hogs		Silos	
	Sown this fall compared with last year	Condition compared with an average	When sown days after September 1	Sown this fall compared with last year	Condition compared with an average				Average product per acre	Affected by rot	Condition compared with an average	Number to be fattened compared with 1913.	Number of silos in county reported	Number of these silos erected this year
	%	%	Days	%	%	%	%	%	Bush.	%	%	%		
Adams,	108	95	28	85	90	105	.....	76	65	.....	93	90	25	11
Allegheny,	100	104	20	91	97	97	85	90	88	5	100	103	84	15
Armstrong,	102	104	18	95	100	103	95	.....	112	.....	96	96	12	4
Beaver,	106	106	23	98	101	93	95	.....	90	.....	94	94	42	1
Bedford,	85	75	35	83	75	80	50	.....	87	.....	100	98	45	6
Berks,	96	82	34	105	90	116	90	.....	100	4	101	102	67	6
Blair,	95	80	32	97	86	83	95	.....	57	7	94	95	78	6
Bradford,	105	96	20	108	97	90	83	.....	128	8	95	90	564	24
Bucks,	95	84	36	100	90	110	90	.....	127	4	88	82	196	100
Butler,	107	104	17	101	100	103	100	.....	98	.....	98	95	149	19
Cambria,	80	90	10	98	87	99	75	.....	110	.....	99	95	45	3
Cameron,	80	90	15	100	100	100	70	.....	150	.....	98	95	8	1
Carbon,	94	85	40	94	83	105	100	.....	125	.....	98	98	3	1
Centre,	100	90	23	97	90	92	.....	.....	102	.....	97	97	6	6
Chester,	102	87	45	100	95	125	80	.....	104	7	98	100	221	27
Clarion,	104	104	11	98	106	101	98	.....	127	.....	98	96	54	4
Clearfield,	110	95	14	97	103	96	.....	94	125	.....	100	103	53	8
Clinton,	105	90	29	103	95	90	80	.....	95	.....	100	95	40	13
Columbia,	106	98	10	94	104	102	72	.....	115	.....	100	99	4	1
Crawford,	104	94	30	100	102	107	92	.....	132	.....	98	97	399	63
Cumberland,	106	101	34	98	100	116	.....	92	75	.....	98	95	41	12
Dauphin,	95	.....	50	97	93	115	103	.....	78	.....	100	95	76	10
Delaware,	98	98	15	98	96	90	94	.....	95	.....	104	102	41	3
Elk,	124	110	12	95	105	95	110	.....	155	2	94	95	40	3
Erie,	106	100	22	92	96	85	84	.....	135	3	99	97	351	77
Fayette,	104	95	19	87	93	86	84	.....	88	.....	100	100	34	7
Forest,	104	75	34	100	75	90	.....	87	72	.....	90	94	2	1
Franklin,	106	.....	.....	.....	.....	.....	.....	87	56	.....	97	95	78	13

Fulton,	101	83	32	85	80	75	55	60	65	.....	94	90	23	2
Greene,	97	93	22	84	91	82	.....	.....	45	.....	100	98	10	2
Huntingdon,	94	84	30	87	80	100	72	78	85	.....	97	100	17	3
Indiana,	101	98	20	98	98	110	86	90	95	3	100	96	41	20
Jefferson,	109	101	14	93	98	104	87	91	130	4	102	98	61	29
Junata,	101	87	33	98	98	94	115	90	48	.....	94	94	17	11
Lackawanna,	100	102	25	97	99	75	75	.....	110	15	100	103	106	11
Lancaster,	102	90	39	99	92	130	.....	.....	118	3	97	90	190	42
Lawrence,	105	100	17	100	98	104	91	80	99	4	100	102	88	12
Lebanon,	102	92	33	97	92	103	.....	.....	86	.....	94	88	68	18
Lehigh,	106	85	40	105	92	100	88	90	135	15	97	90	41	14
Luzerne,	102	90	27	100	100	99	85	.....	118	14	100	97	84	12
Lycoming,	102	98	25	96	95	101	80	75	116	9	95	99	60	8
McKean,	108	90	12	99	100	105	87	.....	125	.....	96	97	289	15
Mercer,	103	104	14	100	103	89	160	78	124	4	98	97	24	6
Mifflin,	98	75	32	97	75	84	70	89	115	.....	98	95	9	.....
Monroe,	91	90	26	96	92	96	75	.....	115	12	94	92	151	13
Montgomery,	93	84	37	110	90	108	100	.....	94	2	97	97	11	4
Montour,	103	105	24	101	100	112	92	72	101	4	100	99	70	17
Northampton,	85	75	42	105	87	160	87	.....	135	12	96	94	64	13
Northumberland,	101	99	26	99	99	95	70	50	96	.....	93	92	11	4
Perry,	97	92	37	93	90	102	93	72	77	.....	104	104	14	2
Philadelphia,	94	83	39	95	80	112	.....	.....	122	.....	100	98	4	4
Pike,	105	90	25	95	85	103	75	.....	135	.....	100	96	193	37
Potter, .....	.....	.....	.....	92	90	98	90	.....	146	10	90	90	12	4
Schuylkill,	100	95	30	100	94	95	80	.....	155	.....	90	100	11	1
Snyder,	99	102	22	102	98	104	86	58	107	3	98	100	133	10
Somerset,	85	96	14	105	94	101	75	88	137	9	104	102	57	8
Sullivan,	92	100	12	88	98	96	80	.....	140	7	100	98	163	26
Susquehanna,	101	100	25	102	101	97	90	.....	128	12	99	95	656	135
Tioga,	110	104	19	97	94	110	87	.....	147	4	97	94	75	13
Union,	98	90	20	96	85	97	96	60	139	3	101	100	26	7
Venango,	107	163	13	98	99	99	92	.....	130	.....	100	87	301	13
Warren,	115	95	12	100	85	90	90	.....	65	.....	99	96	218	43
Washington,	165	102	20	90	98	75	.....	.....	112	20	100	100	466	59
Wayne, .....	.....	.....	.....	.....	92	85	83	95	120	5	101	96	296	59
Westmoreland,	101	161	13	.....	100	100	97	.....	130	8	100	101	111	17
Wyoming,	94	90	21	97	91	85	85	93	88	.....	103	103	69	13
York,	~10	100	30	93	94	116	.....	.....	.....	.....	.....	.....	.....	.....
Total number of reports filed, ..	101	94	*25	97	94	99	85	80	106	6	98	96	7,090	1,227
Average, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*September.

ANNUAL REPORT OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE GIVING PRICES AND PRODUCTION OF FARM PRODUCTS AND LIVESTOCK; PRICES OF FARM LAND AND FARM WAGES FOR THE YEAR 1914

The following report is compiled from the returns received from the official correspondents of the Department:

Cereals:

Wheat—Estimated area harvested,	1,312,000	acres.
Wheat—Product per acre,	18.5	bushels.
Wheat—Total estimated product,	24,272,000	bushels.
Wheat—Average price per bushel,	\$1.03	
Wheat—Total value of crop,	\$25,000,160.00	
Corn—Estimated area harvested,	1,463,000	acres.
Corn—Product per acre,	40	bushels.
Corn—Total estimated product,	58,520,000	bushels.
Corn—Average price per bushel,	\$0.78	
Corn—Total value of crop,	\$45,645,600.00	
Rye—Estimated area harvested,	280,000	acres.
Rye—Product per acre,	17	bushels.
Rye—Total estimated product,	4,760,000	bushels.
Rye—Average price per bushel,	\$0.83	bushels.
Rye—Total value of crop,	\$3,950,800.00	
Oats—Estimated area harvested,	1,073,000	acres.
Oats—Product per acre,	30	bushels.
Oats—Total estimated product,	32,190,000	bushels.
Oats—Average price per bushel,	\$0.50	bushels.
Oats—Total value of crop,	\$16,095,000.00	bushels.
Buckwheat—Estimated area harvested,	280,000	acres.
Buckwheat—Product per acre,	20	bushels.
Buckwheat—Total estimated product,	5,600,000	bushels.
Buckwheat—Average price per bushel,	\$0.76	
Buckwheat—Total value of crop,	\$4,256,000.00	

Hay:

Clover—Price per ton,	\$13.00	
Clover—Estimated yield per acre,	1½	tons.
Timothy—Price per ton,	\$15.20	
Timothy—Estimated yield per acre,	1½	tons.
Alfalfa—Price per ton,	\$17.20	
Alfalfa—Estimated yield per acre,	2¼	tons.

Livestock and Poultry:

Horses—Average price,	\$150.00	
Mules—Average price,	156.00	
Cows—Average price,	58.00	
Lambs—Average price,	4.40	
Ewes—Average price,	4.75	
Steers—Fat, average price per pound, ....	.08	
Steers—For feeding, average price per pound,	.06	
Swine—Shoats, average price per pound, ..	.09	
Fat Hogs—Average price per pound, .....	.10	
Chickens—Dressed, price per pound, .....	.18	
Chickens—Live, price per pound, .....	.13	

Ducks—Dressed, price per pound, .....	.18
Ducks—Live, price per pound, .....	.13
Geese—Dressed, price per pound, .....	.19
Geese—Live, price per pound, .....	.14
Turkeys—Dressed, price per pound, .....	.25
Turkeys—Live, price per pound, .....	.20

Fruit, Vegetables, Etc.:

Apples—Price per bushel,	\$0.52
Peaches—Price per basket, .....	.86
Pears—Price per bushel, .....	.80
Plums—Price per quart, .....	.06
Cherries—Price per quart, .....	.08
Strawberries—Price per quart, .....	.10
Blackberries—Price per quart, .....	.08
Raspberries—Price per quart, .....	.10
Potatoes—Estimated area harvested,	268,000 acres.
Potatoes—Product per acre,	106 bushels.
Potatoes—Total estimated product,	28,408,000 bushels.
Potatoes—Average price per bushel,	\$0.62
Potatoes—Total value of crop,	\$17,612,960.00
Butter—Price per pound, at store, .....	.31
Butter—Price per pound, at market, .....	.33
Milk—Wholesale price, per 100 pounds,	1.63
Milk—Retail price, per quart, .....	.07
Eggs—Price per dozen, .....	.31
Tobacco—Leaf, price per pound, .....	.09
Honey—Price per pound, .....	.16

Wool:

Wool—Unwashed, price per pound,	\$0.21
Wool—Washed, price per pound, .....	.26

Farm Land:

Farm land—Improved, value per acre,	\$75.00
Farm land—Average, value per acre,	50.00

Farm Wages:

Farm wages—By year, with board,	\$235.00
Farm wages—For summer months only,	25.00
Farm wages—By day, with board,	1.20
Farm wages—By day, without board,	1.60
Farm wages—Whole year, without board,...	340.00
Farm wages—Harvest, by day,	1.80
Household help—Female, with board, per week,	3.00

	10	1 01	18	67	45	50	30	74	18	70	22	13 80	16 40	16 50	23
Dauphin,	10	1 01	18	67	45	50	30	74	18	70	22	13 80	16 40	16 50	23
Delaware,	5	1 04	23	80	55	52	45	90	20	75	20	15 60	18 20	16 50	23
Elk,	4	1 15	20	80	30	53	27	90	18	71	22	9 70	14 75	16 50	23
Erie,	12	1 08	19	85	37	53	23	90	18	80	18	17 00	18 00	18 20	2
Fayette,	9	1 04	16	85	32	52	29	87	15	70	19	12 00	14 25	16 30	23
Forest,	7	1 00	19	85	40	55	24	90	15	75	20	14 00	14 75	16 30	23
Franklin,	9	1 00	18	80	44	50	28	75	12	75	13	14 00	15 75	16 30	23
Fulton,	9	1 03	13	80	25	52	21	87	15	85	13	14 00	17 00	16 30	23
Greene,	9	1 02	16	85	30	53	32	90	15	78	12	15 00	17 00	16 30	23
Huntingdon,	11	1 03	15	80	33	51	26	83	11	78	12	15 00	16 70	16 30	23
Indiana,	14	1 02	16	85	36	50	24	83	16	72	20	12 00	13 50	16 30	23
Jefferson,	11	1 01	17	85	34	52	26	80	16	75	17	11 00	12 70	15 30	13
Junata,	8	1 00	15	80	33	46	27	78	14	75	20	11 00	12 70	15 30	13
Lackawanna,	5	1 00	15	75	30	46	27	87	17	75	25	17 00	18 00	16 30	23
Lancaster,	25	98	24	77	56	50	38	80	23	71	16	12 10	16 00	18 00	34
Lawrence,	9	1 00	18	80	35	50	24	78	17	71	16	12 10	16 00	18 00	34
Lebanon,	6	98	24	74	53	45	33	76	20	70	20	15 30	17 00	17 50	34
Lehigh,	11	1 03	18	80	46	48	35	87	19	76	20	16 40	16 40	18 00	23
Luzerne,	9	1 05	20	70	35	54	31	80	15	76	20	13 00	19 25	18 00	23
Lycoming,	12	1 04	17	75	48	50	28	76	15	75	21	13 00	14 90	18 00	23
McKean,	4	1 00	19	84	25	54	20	76	15	75	22	11 00	12 00	18 00	23
Mercer,	18	1 02	19	77	42	51	26	88	18	73	21	10 00	12 00	18 00	23
Mifflin,	4	1 00	19	72	35	42	28	82	17	80	23	13 50	16 00	18 00	23
Monroe,	9	1 03	18	81	37	55	35	87	17	80	23	14 50	18 00	18 00	23
Montgomery,	16	1 04	16	80	46	54	33	90	19	83	22	13 10	15 40	16 30	23
Montour,	5	1 01	17	72	43	47	33	75	14	73	25	13 25	16 00	16 30	23
Northampton,	10	1 02	17	72	47	50	37	87	19	85	20	15 00	17 50	16 30	23
Northumberland,	7	97	16	72	42	48	28	77	15	68	20	13 00	16 50	16 30	23
Perry,	9	1 00	15	70	45	45	27	73	15	64	17	10 00	12 80	16 30	23
Philadelphia,	3	1 00	28	80	48	53	40	95	15	86	17	16 00	18 00	18 00	23
Pike,	5	1 06	18	90	39	51	30	75	18	86	17	18 00	18 00	18 00	23
Potter,	9	1 05	22	84	40	51	23	1 00	17	75	20	11 00	12 25	18 00	23
Schuylkill,	10	1 02	19	85	41	51	35	82	18	82	25	16 90	19 00	18 00	23
Snyder,	8	98	16	70	44	43	30	70	16	73	18	11 80	13 80	18 00	23
Somerset,	10	98	18	80	40	52	35	82	16	70	18	12 00	14 00	18 00	23
Sullivan,	6	1 10	19	78	45	50	31	79	19	78	19	12 80	13 00	18 00	23
Susquehanna,	12	1 05	20	80	35	53	34	90	16	82	20	12 00	13 50	18 00	23
Tioga,	9	1 05	20	80	42	50	26	90	16	75	20	10 80	13 30	18 00	23
Union,	10	99	18	65	42	45	29	66	16	75	17	12 80	13 30	18 00	23
Venango,	7	1 05	17	80	35	50	30	90	17	70	20	11 40	13 30	18 00	23
Warren,	6	1 15	24	77	41	51	27	90	17	69	20	9 10	10 00	18 00	23
Washington,	14	1 02	17	80	37	54	26	92	16	82	20	14 80	15 80	19 00	23
Wayne,	11	1 02	18	84	43	55	35	90	17	82	20	13 30	14 20	19 00	23
Westmoreland,	10	1 10	16	80	37	52	32	85	17	82	21	14 10	15 40	19 00	23
Wyoming,	5	1 02	18	84	43	52	32	78	14	76	21	12 00	13 80	19 00	23
York,	10	1 02	19	73	47	48	30	78	18	76	21	12 00	14 80	19 00	23
Total number reports filed,	658														
Average,		\$1.03	18.5	\$0 78	40	\$0 50	30	\$0 83	17	\$0 76	20	\$13 00	\$15 20	\$17 30	24

CROP REPORT FOR THE YEAR 1914--Continued

Counties	Livestock and Poultry																
	Horses, average price per head	Mules, average price per head	Cows, average price per head	Lambs, average price per head	Ewes, average price per head	Steers, fat, price per pound	Steers, for feeding, price per pound	Swine, shoats, price per pound	Fat hogs, price per pound	Chickens, dressed, price per pound	Chickens, live, price per pound	Ducks, dressed, price per pound	Ducks, live, price per pound	Geese, dressed, price per pound	Geese, live, price per pound	Turkeys, dressed, price per pound	Turkeys, live, price per pound
Adams,	\$120 00	\$135 60	\$55 00	\$4 45	\$4 40	\$0 08	\$0 07	\$0 09	\$0 09	\$0 15	\$0 11	\$0 13	\$0 10	\$0 15	\$0 11	\$0 20	\$0 17
Allegheny,	180 00	165 00	70 00	3 86	4 40	08	06	08	09	21	15	22	16	20	15	26	21
Armstrong,	165 00	170 00	65 00	4 30	4 85	08	06	08	09	18	13	17	13	17	12	26	18
Beaver,	150 00	160 00	65 00	4 90	4 90	09	07	08	10	22	16	23	19	20	15	28	21
Bedford,	154 00	170 00	46 00	4 00	5 00	07	06	08	09	15	11	16	12	18	13	21	16
Berks,	140 00	165 00	63 00	5 25	4 95	08	07	08	11	20	14	16	14	21	18	21	16
Blair,	147 00	154 00	53 00	4 90	5 25	07	06	08	10	18	13	18	14	21	14	23	19
Bradford,	165 00	175 00	56 00	5 25	4 80	07	05	08	09	16	12	15	12	18	15	24	18
Bucks,	150 00	170 00	70 00	4 60	5 40	08	07	11	18	18	15	18	14	18	14	24	18
Butler,	148 00	130 00	60 00	3 45	4 00	08	06	08	09	18	13	20	14	14	14	26	22
Cambria,	158 00	152 00	54 00	4 50	4 30	08	06	10	10	19	14	22	15	20	15	28	22
Cameron,	158 00	170 00	50 00	3 50	4 40	10	08	10	12	20	14	15	11	15	11	28	23
Carbon,	165 00	160 00	55 00	.....	.....	08	06	11	11	26	16	21	16	22	16	25	18
Centre,	153 00	145 00	52 00	4 80	4 30	08	06	07	09	17	12	20	14	22	16	27	23
Chester,	140 00	155 00	70 00	4 80	4 80	08	07	10	11	18	14	17	15	17	14	26	19
Clarion,	165 00	180 00	50 00	5 20	4 50	08	07	08	08	18	12	16	11	15	11	26	22
Clearfield,	156 00	140 00	45 00	4 50	5 00	09	07	10	10	20	14	18	13	19	13	23	16
Columbia,	140 00	140 00	52 00	4 00	5 00	06	05	08	10	17	13	16	12	21	14	29	24
Crawford,	150 00	157 00	50 00	4 60	4 60	07	06	09	10	16	13	16	13	16	13	26	21
Cumberland,	140 00	140 00	55 00	4 50	4 60	07	06	07	08	17	12	18	12	18	11	24	20
Dauphin,	130 00	133 00	60 00	5 20	4 40	08	07	08	09	18	12	17	13	18	14	24	20
Delaware,	143 00	153 00	60 00	5 50	5 80	08	06	10	11	18	14	19	15	20	17	27	23
Elk,	156 00	180 00	72 00	.....	.....	.....	.....	10	11	20	17	19	15	.....	.....	27	21
Erie,	165 00	.....	55 00	.....	.....	.....	.....	10	12	20	15	.....	.....	.....	.....	29	23
Fayette,	140 00	.....	60 00	4 50	4 35	08	07	09	09	19	13	21	14	21	15	35	18
Forest,	170 00	166 00	56 00	4 60	4 25	07	06	08	09	20	16	20	14	20	15	39	20
Franklin,	115 00	120 00	52 00	4 50	4 25	08	06	08	10	18	13	.....	.....	.....	.....	28	22
Fulton,	125 00	140 00	45 00	4 60	4 25	07	06	08	09	15	11	15	11	15	11	24	16
Greene,	135 00	140 00	60 00	3 85	3 75	08	07	07	08	16	12	17	12	17	13	20	16
Huntingdon,	140 00	145 00	52 00	3 75	3 90	07	06	08	09	15	12	16	11	.....	.....	22	16

CROP REPORT FOR THE YEAR 1914—Continued

Fruit, Vegetables, etc.

Counties

Counties	Apples, price per bushel	Peaches, price per basket	Pears, price per bushel	Plums, price per quart	Cherries, price per quart	Strawberries, price per quart	Blackberries, price per quart	Raspberries, price per quart	Potatoes, price per bushel	Potatoes, estimated yield in county, per acre	Butter, price per pound, at store	Butter, price per pound, at market	Milk, wholesale, price per 100 pounds	Milk, retail, price per quart	Eggs, price per dozen	Tobacco, leaf, price per pound	Honey, price per pound
Adams,	\$0 41	\$0 40	\$0 33	\$0 05	\$0 06	\$0 10	\$0 07	\$0 08	\$0 65	90	\$0 25	\$0 30	\$1 40	\$0 06	\$0 27	.....	\$0 15
Allegheny,	67	1 09	1 06	08	09	11	09	11	75	78	31	36	.....	08	33	.....	19
Armstrong,	52	1 20	88	06	09	10	08	10	66	78	27	30	.....	07	26	.....	18
Beaver,	72	1 03	97	08	08	10	09	10	80	90	32	33	.....	09	34	.....	20
Bedford,	25	75	60	06	08	11	07	09	65	110	28	32	2 00	06	27	.....	16
Berks,	50	60	50	06	06	09	07	09	60	102	35	37	1 55	06	33	09	20
Blair,	50	80	55	09	08	09	08	09	49	70	30	32	1 75	07	32	.....	18
Bradford,	48	90	90	07	10	10	10	09	40	135	37	35	1 60	06	30	.....	11
Bucks,	56	1 00	55	06	07	10	09	10	67	114	28	32	1 57	07	34	.....	14
Butler,	50	60	95	06	08	09	09	10	65	115	28	32	.....	07	30	.....	20
Cambria,	43	90	25	08	09	09	09	11	70	135	32	34	.....	08	32	.....	17
Cameron,	60	80	95	09	09	11	09	11	50	100	35	35	.....	07	35	.....	13
Carbon,	65	90	80	10	09	10	09	10	50	125	35	38	1 75	07	32	.....	16
Centre,	45	90	78	06	07	11	08	09	60	108	28	27	1 53	06	28	.....	17
Chester,	60	50	60	07	07	10	09	10	65	101	38	40	1 75	06	37	09	15
Clarion,	45	1 25	80	05	07	10	06	09	60	116	29	30	.....	07	29	.....	18
Clearfield,	50	1 00	90	06	08	10	09	10	57	129	34	36	.....	07	35	.....	16
Clinton,	48	.....	88	06	08	11	09	10	68	75	34	36	1 65	06	36	13	18
Columbia,	40	96	83	04	07	10	07	09	55	103	29	31	1 90	06	29	.....	15
Crawford,	50	1 50	85	07	10	08	10	11	52	125	28	32	1 55	06	28	.....	16
Cumberland,	52	70	55	05	07	09	08	09	70	81	28	32	1 60	06	26	.....	19
Dauphin,	65	60	50	06	06	09	08	09	64	73	30	34	1 55	07	31	09	20
Delaware,	1 00	60	60	08	07	.....	09	12	80	128	38	40	1 60	08	32	.....	20
Elk,	60	.....	1 00	.....	.....	.....	08	09	60	130	35	35	1 55	07	34	.....	13
Erie,	55	1 30	84	08	09	.....	10	12	48	140	32	34	1 65	06	30	.....	16

Fayette,	70	1 20	1 00	07	09	10	10	08	12	84	80	31	34	1 90	08	29	.....	18
Forest,	52	.....	90	07	11	12	10	08	09	62	96	30	.....	.....	06	28	.....	17
Franklin,	50	45	50	05	06	10	10	07	09	67	55	28	31	1 40	05	29	.....	14
Fulton,	35	70	56	04	06	09	09	06	07	76	81	25	27	.....	05	25	.....	12
Greene,	47	1 35	1 00	05	06	11	09	08	10	77	42	25	30	.....	07	29	.....	20
Huntingdon,	43	98	65	05	06	09	09	08	08	76	77	28	28	.....	06	29	.....	18
Indiana,	48	1 10	87	05	08	11	11	08	10	63	98	29	32	.....	07	28	.....	16
Jefferson,	44	1 35	1 00	05	08	10	10	07	10	62	115	28	31	.....	06	27	.....	15
Junata,	53	65	60	05	06	09	09	06	15	65	55	27	32	1 48	05	29	.....	15
Lackawanna,	46	80	1 25	05	10	14	10	10	05	62	115	31	34	1 50	08	34	.....	15
Lancaster,	65	85	54	06	06	09	09	08	09	60	105	32	35	1 62	06	33	08	17
Lawrence,	54	1 20	1 40	06	06	09	09	09	10	63	104	32	33	1 60	07	30	.....	22
Lebanon,	65	66	67	08	06	09	09	06	09	66	95	33	37	1 54	07	32	10	22
Lehigh,	55	60	73	08	08	10	10	09	10	56	160	31	35	1 45	07	31	.....	18
Luzerne,	57	90	96	05	09	10	10	09	12	65	112	33	37	.....	07	36	.....	15
Lycoming,	58	1 00	85	06	07	11	11	10	10	56	110	30	33	.....	06	30	.....	13
McKean,	50	.....	.....	.....	.....	11	11	10	.....	52	160	31	32	1 70	06	30	.....	12
Mercer,	40	1 10	88	07	10	12	10	06	11	50	122	24	28	1 70	07	27	.....	18
Midlin,	52	80	50	05	06	12	10	06	08	70	60	29	34	.....	06	28	.....	16
Montroe,	45	87	90	06	08	11	11	09	11	62	120	29	34	.....	05	32	.....	16
Montgomery,	64	50	60	07	08	11	11	09	10	72	103	38	40	1 70	07	33	.....	18
Montour,	48	85	1 00	04	08	11	11	09	10	56	85	30	34	1 60	07	33	.....	15
Northampton,	53	57	50	08	08	10	10	09	11	64	140	34	37	1 55	06	33	.....	17
Northumberland,	45	87	70	07	09	10	10	09	11	74	70	26	29	.....	07	30	.....	18
Perry,	63	63	72	05	06	08	08	06	07	73	70	36	35	.....	06	33	.....	16
Philadelphia,	48	50	50	07	08	09	09	07	09	73	137	36	35	.....	07	35	.....	.....
Pike,	53	.....	45	.....	.....	08	09	09	11	70	133	30	35	.....	07	32	.....	16
Potter,	40	.....	85	06	10	10	10	07	10	33	135	31	31	1 50	06	32	.....	13
Schuylkill,	62	66	83	07	08	11	11	10	12	63	146	35	38	.....	08	34	.....	20
Snyder,	40	75	55	03	07	08	08	06	09	56	110	26	32	.....	06	30	.....	15
Somerset,	35	63	82	05	08	10	10	08	10	55	116	27	29	.....	07	26	.....	18
Sullivan,	33	90	90	04	06	10	10	07	10	56	123	30	34	.....	05	30	.....	11
Susquehanna,	47	90	95	08	10	10	10	10	11	50	114	30	33	1 60	05	32	.....	13
Tioga,	37	1 00	85	04	08	10	10	07	10	40	145	32	32	1 70	05	32	.....	12
Union,	40	80	70	04	07	09	09	07	09	60	85	27	28	1 50	06	25	.....	18
Venango,	52	95	95	07	09	11	11	09	10	57	127	32	35	.....	07	32	.....	18
Warren,	40	.....	.....	07	11	11	11	10	12	50	110	31	32	.....	06	30	.....	17
Washington,	68	90	90	05	09	11	11	11	11	77	62	30	33	1 90	07	30	.....	20
Wayne,	45	1 00	92	08	10	11	11	09	12	58	119	30	33	1 60	05	32	.....	14
Westmoreland,	78	.....	1 05	08	10	11	11	10	11	77	121	35	36	.....	09	34	.....	20
Wyoming,	40	1 00	1 00	05	09	09	09	09	09	50	125	30	35	1 45	05	30	.....	13
York,	55	58	50	06	06	08	08	06	07	63	74	30	33	1 55	06	32	08	20
Average,		\$0 86	\$0 80	\$0 06	\$0 08	\$0 10	\$0 10	\$0 08	\$0 10	\$0 62	106	\$0 31	\$0 33	\$1 63	\$0 07	\$0 31	\$0 09	\$0 16

CROP REPORT FOR THE YEAR 1914—Continued

Counties	Wool		Farm Land		Farm Wages						
	Wool, unwashed, price per pound	Wool, washed, price per pound	Farm land, improved, value per acre	Farm land, average, value per acre	Farm wages, by year, with board	Farm wages, for summer months only,	Farm wages, by day, with board	Farm wages, by day, without board	Farm wages, whole year, without board	Farm wages, harvest, by day	Household help, female, with board, per week
Adams,	\$0 23	30 30	\$65 00	\$45 00	\$190 00	\$21 00	\$1 20	\$1 50	\$300 00	\$1 50	\$2 10
Allegheny,	23	38	150 00	105 00	260 00	30 00	1 50	2 00	390 00	2 30	4 25
Armstrong,	23	25	65 00	45 00	240 00	26 00	1 25	1 75	360 00	2 00	3 40
Beaver,	22	17	73 00	54 00	250 00	27 00	1 25	1 75	375 00	2 00	3 90
Bedford,	18	21	50 00	33 00	185 00	20 00	1 10	1 50	280 00	1 50	2 50
Berks,	20	25	80 00	55 00	215 00	23 00	1 15	1 50	325 00	1 25	3 00
Blair,	20	25	75 00	45 00	230 00	25 00	1 20	1 70	315 00	1 80	3 00
Bradford,	21	28	48 00	30 00	240 00	27 00	1 20	1 60	.....	2 00	3 25
Bucks,	22	26	90 00	50 00	235 00	25 00	1 15	1 55	340 00	1 80	3 40
Butler,	22	24	76 00	46 00	220 00	25 00	1 25	1 70	350 00	2 00	3 50
Cambria,	22	15	65 00	46 00	250 00	29 00	1 30	1 80	350 00	1 80	3 25
Cameron,	22	25	30 00	18 00	275 00	32 00	1 25	1 60	375 00	2 00	3 00
Carbon,	21	28	48 00	32 00	225 00	23 00	1 20	1 55	330 00	1 70	2 50
Centre,	21	23	70 00	50 00	240 00	24 00	1 25	1 55	310 00	1 60	2 50
Chester,	19	25	105 00	78 00	250 00	27 00	1 10	1 50	350 00	1 85	3 00
Clarion,	20	25	65 00	40 00	240 00	26 00	1 40	1 85	350 00	1 75	3 50
Clearfield,	20	25	45 00	20 00	250 00	28 00	1 15	1 60	.....	2 00	3 00
Clinton,	23	29	60 00	40 00	210 00	25 00	1 20	1 60	.....	1 50	2 60
Columbia,	20	20	69 00	40 00	210 00	21 00	1 00	1 45	.....	1 40	2 70
Crawford,	21	21	50 00	35 00	200 00	28 00	1 25	1 60	350 00	2 00	3 50
Cumberland,	21	24	100 00	70 00	225 00	23 00	1 10	1 50	300 00	1 60	2 40
Dauphin,	19	23	90 00	60 00	240 00	24 00	1 10	1 50	360 00	1 60	3 00
Delaware,	24	26	300 00	200 00	250 00	25 00	1 25	1 75	400 00	2 00	4 00
Elk,	24	26	50 00	42 00	270 00	30 00	1 50	2 00	.....	2 35	3 75
Erie,	22	27	57 00	38 00	265 00	28 00	1 40	1 90	400 00	2 20	3 75

Fayette,	21	25	70 00	50 00	260 00	28 00	1 20	1 70	360 00	2 00	3 20
Forest,	22	26	40 00	30 00	270 00	28 00	1 30	1 80	.....	2 15	3 30
Franklin,	23	24	40 00	10 00	190 00	20 00	1 10	1 40	275 00	1 60	2 40
Fulton,	24	24	32 00	18 00	190 00	20 00	1 00	1 45	270 00	1 70	2 40
Greene,	25	28	73 00	55 00	255 00	25 00	1 10	1 50	320 00	1 50	3 00
Huntingdon,	26	27	45 00	25 00	195 00	21 00	1 10	1 50	325 00	1 70	3 60
Indiana,	27	24	48 00	30 00	250 00	25 00	1 15	1 70	.....	1 70	3 10
Jefferson,	28	29	57 00	35 00	235 00	25 00	1 10	1 60	340 00	1 60	3 55
Junata,	29	26	56 00	42 00	190 00	18 00	1 00	1 40	.....	1 25	3 50
Lackawanna,	30	28	60 00	50 00	280 00	26 00	1 25	1 80	.....	2 15	3 00
Lancaster,	31	28	140 00	95 00	320 00	24 00	1 20	1 80	.....	1 70	3 00
Lawrence,	32	28	80 00	53 00	240 00	26 00	1 40	1 90	325 00	2 00	4 00
Lebanon,	33	28	100 00	65 00	215 00	22 00	1 15	1 50	.....	1 60	3 00
Lehigh,	34	28	98 00	65 00	216 00	23 00	1 20	1 60	350 00	1 50	3 50
Luzerne,	35	28	80 00	40 00	250 00	24 00	1 20	1 60	.....	1 75	3 00
Lycoming,	36	28	60 00	68 00	260 00	25 00	1 10	1 50	.....	1 65	3 85
McKean,	37	28	35 00	25 00	.....	.....	1 50	2 00	.....	2 25	3 00
Mercer,	38	28	65 00	40 00	240 00	27 00	1 25	1 75	380 00	1 80	3 50
Mifflin,	39	29	90 00	70 00	200 00	22 00	1 15	1 60	300 00	1 60	3 50
Monroe,	40	29	50 00	30 00	210 00	26 00	1 20	1 60	320 00	1 90	3 50
Montgomery,	41	29	90 00	65 00	240 00	28 00	1 25	1 70	345 00	1 80	3 50
Montour,	42	29	80 00	55 00	230 00	24 00	1 20	1 60	330 00	1 70	3 50
Northampton,	43	29	75 00	60 00	200 00	22 00	1 25	1 65	.....	1 70	3 90
Northumberland,	44	29	70 00	40 00	200 00	20 00	1 10	1 50	.....	1 70	3 60
Perry,	45	29	60 00	35 00	175 00	18 00	1 00	1 50	300 00	1 40	3 25
Philadelphia,	46	29	400 00	260 00	.....	.....	1 10	1 60	.....	1 16	4 00
Pike,	47	29	50 00	35 00	215 00	25 00	1 00	1 50	.....	1 80	4 00
Potter,	48	29	30 00	20 00	265 00	30 00	1 40	1 80	.....	2 00	3 46
Schuylkill,	49	29	75 00	55 00	200 00	28 00	1 20	1 60	.....	1 75	3 00
Snyder,	50	29	85 00	60 00	190 00	20 00	1 10	1 50	.....	1 40	3 40
Somerset,	51	26	60 00	40 00	240 00	26 00	1 20	1 65	.....	1 70	3 70
Sullivan,	52	26	32 00	24 00	260 00	26 00	1 10	1 50	.....	1 80	3 10
Susquehanna,	53	27	40 00	25 00	275 00	27 00	1 35	1 80	.....	2 00	3 30
Tioga,	54	28	40 00	25 00	240 00	28 00	1 30	1 80	.....	1 90	3 00
Union,	55	24	90 00	60 00	216 00	21 00	1 10	1 45	350 00	1 40	3 50
Venango,	56	24	35 00	22 00	216 00	24 00	1 25	1 80	.....	1 75	3 70
Warren,	57	24	40 00	25 00	270 00	28 00	1 30	1 80	.....	2 00	3 75
Washington,	58	27	75 00	55 00	250 00	25 00	1 20	1 75	.....	2 00	3 50
Wayne,	59	28	48 00	25 00	250 00	25 00	1 20	1 65	.....	2 00	3 00
Westmoreland,	60	28	88 00	60 00	260 00	27 00	1 30	1 75	390 00	2 00	3 30
Wyoming,	61	28	60 00	32 00	270 00	27 00	1 25	1 80	.....	1 85	3 00
York,	62	28	15 00	48 00	190 00	26 00	1 15	1 50	.....	1 60	3 65
Average,	63	26	75 00	50 00	235 00	25 00	1 20	1 60	\$340 00	\$1 80	\$3 00

The following comparison of tables for the past nine years shows the prices of the various products of Pennsylvania:

TABLE OF COMPARISON

	1905	1906	1907	1908	1909	1910	1911	1912	1913
Wheat,	\$0 83	\$0 78	\$0 95	\$0 96	\$1 10	\$0 95	\$0 90	\$0 95	\$0 94
Corn,	57	55	65	71	75	65	70	70	75
Oats,	37	40	53	55	50	43	50	45	47
Rye,	63	61	73	76	77	75	80	80	75
Buckwheat,	56	58	68	73	70	62	70	65	72
Hay, clover,	10 00	11 00	11 00	10 50	12 00	12 00	18 00	14 00	13 00
Hay, timothy,	12 00	13 50	16 50	13 00	15 00	15 00	21 00	16 00	15 00
Horses, average,	131 00	145 00	148 00	150 00	150 00	150 00	160 00	160 00	160 00
Mules, average,	139 00	155 00	155 00	160 00	160 00	175 00	175 00	175 00	170 00
Cows, average,	35 00	38 00	37 00	36 00	38 00	42 00	40 00	45 00	55 00
Lambs, average,	3 95	4 15	4 25	4 00	4 00	4 00	3 00	4 00	4 25
Ewes, average,	4 10	4 50	4 75	4 50	4 25	4 00	4 00	4 50	4 50
Steers, fat, per pound,	04	05	05	05	06	06	05	06	08
Steers, for feeding, per pound,	03	04	04	04	06	05	04	05	06
Swine, shoats, per pound,	05	06	06	06	07	08	07	07	09
Hogs, fat, price per pound,	06	07	08	07	08	09	08	08	10
Chickens, dressed, price per pound, ..	15	15	15	14	16	17	17	18	18
Chickens, live, price per pound, ...	10	11	10	10	12	12	11	12	14
Apples, per bushel,	70	55	70	70	85	75	70	65	86
Peaches, per basket,	90	1 10	1 50	1 20	1 25	1 50	1 25	1 00	1 10
Pears, per bushel,	90	90	1 10	85	1 10	95	85	90	1 00
Plums, per quart,	07	07	08	07	07	07	08	08	08
Cherries, per quart,	08	07	09	07	08	08	08	08	09
Blackberries, per quart,	07	07	08	07	09	08	08	08	09
Raspberries, per quart,	08	08	09	09	07	08	09	09	10
Potatoes, per bushel,	59	60	70	80	70	55	95	60	80
Butter, per pound, at store,	22	23	27	27	28	28	28	28	30
Butter, per pound, at market,	25	27	36	30	32	31	30	32	33
Milk, wholesale, per 100 pounds, ..	1 30	1 50	1 50	1 30	1 40	1 60	1 50	1 50	1 60
Milk, retail, per quart,	05	06	06	06	07	07	07	07	07
Eggs, per dozen,	24	25	27	27	28	28	28	28	30
Farm land, improved, value per acre,	55 00	60 00	60 00	60 00	60 00	60 00	60 00	65 00	67 00
Farm land, average, value per acre, ..	35 00	40 00	58 00	38 00	40 00	40 00	35 00	40 00	45 00
Farm wages, by year, with board, ..	190 00	210 00	225 00	200 00	200 00	200 00	200 00	240 00	245 00
Farm wages, summer months only, ..	19 00	20 00	22 50	20 00	20 00	20 00	20 00	25 00	25 00
Farm wages, by day, with board, ..	1 00	1 10	1 10	1 05	1 10	1 10	1 25	1 25	1 25
Farm wages, by day, without board, ..	1 35	1 40	1 45	1 35	1 40	1 40	1 50	1 50	1 50
Farm wages, whole year, without board,	295 00	300 00	315 00	310 00	325 00	340 00	360 00	360 00	345 00
Farm wages, harvest, by day,	1 60	1 65	1 75	1 75	1 75	1 50	2 00	2 00	1 80
Farm wages, household help, female, ..	2 50	2 50	2 75	2 75	2 75	3 00	3 00	3 00	3 00

Respectfully submitted,

L. H. WIBLE,
Statistician.

PAPERS READ AND ADDRESSES DELIVERED AT
THE ANNUAL MEETING OF THE FARMERS' NOR-
MAL INSTITUTE, HELD AT STROUDSBURG, PA.,
MAY 26 TO 28, 1914.

ADDRESS OF WELCOME

HON. CHARLES B. STAPLES, *Stroudsburg, Pa.*

Mr. Chairman, Ladies and Gentlemen: I am sure that it is a pleasing thing to our community here to have in its midst any representative body from the State of Pennsylvania, and especially is it so to have a representative body of farmers, for Monroe county is largely an agricultural district, and we know that "the first farmer was the first man."

When Pennsylvania is spoken of, the first thought in the mind of the ordinary person is: "That is the State where they mine so much coal; it is one of the states where they make so much cement; one of the states that manufactures so much steel and iron, and has thousands of miles of railroads." They forget that Pennsylvania also sizes up well as an agricultural state; it stands first, in its production of rye, of which it grows a sum total of five million bushels a year; second, in hay and potatoes; and, notwithstanding the great territory in the West where they raise wheat, Pennsylvania today is eleventh in wheat; and it should be a pleasing thing to every citizen of Stroudsburg today to welcome you who represent the farmers of this great agricultural State of Pennsylvania, and I welcome you for them; and we hope that while you are here you will enjoy what we call "a pleasant little town"; and we know that when you get acquainted with our people, they will give you a pleasant little reception.

It is not my intention today to talk to you about farming. I tried that once, and talked about apple raising. I made what I thought was a nice little talk, but when I got through a farmer got up, and said that if they were to work along such ideas, they might as well give up at once. I have not attempted it since. But there are several things that I want to talk to you about because they have been brought to my attention, and I know that you are interested in them.

One of them is the State highways. The reason I call them to your attention is, because I think that such a representative body of men should take almost as much interest in the highways of the State as they do in the production of crops, because we know that good roads make a better market, a safer market, and an easier market; while bad roads practically put the farmer out of the market. I don't know whether you gentlemen and ladies know much about it, but the roads of our county, as they exist today, are a shame and a

disgrace, and I have no doubt that the same thing is true about other counties. They are full of bad places. The small bridges are getting in such a state that they are positively dangerous, and these roads, instead of getting better, or even staying the same, are getting worse, and there is nothing being done to make them better. In the State of Pennsylvania today there are three hundred and ninety-seven "state routes" as they are called, going from point to point—from Philadelphia to Scranton, Wilkes-Barre to Stroudsburg, for instance, and these were built for the benefit of the people, and for the benefit of the farmers as well as the others. When you travel on them you are in misery. You go bumping round, and it will soon be so that no one will want to travel on them. The control of these roads is vested entirely in the State Highway Department, together with the Legislature, and the municipalities are prevented from having anything to do with them. At every session of Court there come complaints that this road or that is almost impassable. And here is the disgraceful condition of the Auditor General of the State and the State Highway Commissioner quarreling as to who shall have the spending of the money that should be turned over to the proper authorities for its proper purpose of repairing and maintaining the State highways. And all the time the roads are getting worse. There is a writ now before the Courts of Dauphin county, to show reason why a mandamus should not be granted and the Auditor General be compelled to order this money paid over to the State Highway Commissioner. If it is granted, the State Treasurer will appeal to the Supreme Court, and that has adjourned for the summer. If there is no other remedy, the Governor should call a special meeting of the Legislature to make proper provision for the State highways. These three hundred and ninety-seven State routes are crying for the necessary repairs which cannot be made. Why, it will be economical to call a special meeting of the State Legislature to appropriate money to repair these roads. It would save money. I say again, this is necessary. They made these laws, and put this burden upon the people, and they should be made to fix these roads. The laws should be so enforced that if the State Highway Commissioner does not keep them in repair, he may be brought into the Court of Quarter Session, the same as any one else. It is a disgrace to the State to allow matters to go on as they are.

That is one of the things I want to talk to you about. Here is the other one. I don't know what you farmers consider the greatest crop. There might be a diversity of opinions on that; in Lancaster county, they would probably say, tobacco; in Monroe county, buckwheat, and I want to say that there is no county in the United States where they raise as good buckwheat and make as good sausage as they do in Monroe county. If you don't believe it, come over here and get a breakfast of buckwheat cakes and sausage some fine winter morning. In another place, they might say rye, and in another, apples; but I want to tell you people right here that the best crop that Pennsylvania raises is boys.

I want to tell you that the roll of great names has inscribed upon it the names of boys who came from the country. It is the farm, and the family of the farmer, that makes the United States what it is today. I don't give the credit to the pure air, or the quietness and

absence of distractions, and that sort of thing. It is true they have their effect. It is not due to a mind properly exercised, in a sound body; the credit is due to the God-fearing mother who raises these boys and sends them into the city, steeled against temptations, to make of themselves what they do. There is no time when we need more of them than today. Look at the conditions in Colorado, which are next door to anarchy; look at conditions where the Socialists invade the churches. I tell you that we have need today in this United States, of the influence and teachings of these God-fearing mothers upon the young men of today who are to go out into the world, filled with zeal for their country and their God, to make of themselves the great men of the future.

I have been talking of the boys; given God-fearing mothers, they will take care of the girls. We men don't know very much about it; we leave it to the mothers; but if we took as good care to see that the standards of our boys are all right as we do to see that the chickens are all right, or the calves or the hogs are all right, we would have a better crop of boys. We don't any of us do that. I don't except myself, or I would not stand here and say this. I don't want to say it, but I don't know any other name for it, than just plain cowardice. Just as the sound of the cannon ball that was fired at Bunker Hill echoed round the world, so will the influence and inspiration of a good boy go round the world. Let us give a little more thought to our boys. That is all I have to say.

ADDRESS OF WELCOME

By C. L. EDINGER, Burgess, *Stroudsburg, Pa.*

Ladies and Gentlemen, I welcome you. It affords me great pleasure this afternoon to extend to you the freedom of our city. Do with it what you like. You have come to what I think is one of the most beautiful towns in Pennsylvania.

It is generally customary to extend to organizations of this kind, the key to the city. But I succeeded a Democratic administration, and they have not left a key for me; but if you visit our department stores, our offices and our shops, I assure you that every courtesy will be extended to you. And for the members who have not brought their wives along, and may possibly get a little hilarious, I have instructed the borough officers to deal gently with you, and return you to the hotel, instead of locking you up. I want you to leave us with a warm spot in your heart for us, and return again to our midst,

RESPONSE TO ADDRESS OF WELCOME

HON. A. L. MARTIN, *Director of Institutes*

Mr. Chairman, Fellow-workers, Gentlemen representing the City in which we are holding our meetings, and the County of Monroe: For sixteen years past, it has been the custom of the Bureau of Farmers' Institutes, in the Department of Agriculture, to hold an annual meeting of this character. It has always been the custom in places where we have gone, for certain persons to be selected by the home people to extend to us an address of welcome. I am frank to say that in my sixteen years' experience I can think of no place that we have visited, in which there has been extended to this organization a more hearty and generous and uplifting welcome, than has been given to us here in Stroudsburg. You have opened to us the best in your town, guarded, of course, just a little, in the matter of taking our delegates to places of safety at times, which was very considerate, indeed, and for which we are very thankful.

Judge Staples, you have mentioned, in your address of welcome, something of the conditions in Monroe county. You claim to be an agricultural county, and properly so; but from the outside of some of these places here, we hardly know whether we are in an agricultural county or not. Still, we know that Monroe is an agricultural county. And we know more than that. We know that not only do you cultivate the soil, but you look toward the cultivation of the mind and the soul. You are giving close attention to the education, and the development of the better faculties of the child. This is to your credit. And not only has Monroe county the reputation of giving attention to these things, but Nature has here placed natural conditions that exist nowhere else in Pennsylvania. You are properly called "The Switzerland of America," and I can say here that among other things that induced these farmers to come to Stroudsburg for their meeting, the beauty of Stroudsburg and its surroundings at this season of the year, had its part, and as we look at the handwriting of Nature on these mountain sides, and in the beautiful valleys, we will carry with us, when we leave here, memories that will never be forgotten.

I want to say a few words about some other things. We held in Pennsylvania,—last year, over four hundred of these Farmers' Institutes, with an attendance of something over two hundred and eight thousand people. These institutes were devoted to the discussion of some of the most important subjects now up for solution in the advancement of agriculture. What are these subjects? First, I put soil building. The farmers of Pennsylvania—the farmers of the world have before them the greatest problem of the day in trying to feed their soils so as to increase their productivity and keep them from becoming depleted, and the farms from being added to list of abandoned and worn-out farms. In Pennsylvania, not so much as in some other states, we have seen this. Her German population is wedded to the soil, and we have here some of the oldest landmarks

of agriculture in the country. You cannot have a good farm without soil.

Then the next is, feeding the soil. And the third is home-making. Throughout Pennsylvania there are approximately two hundred and eighteen thousand or more farm houses, and who would there be to build up these farm houses today were it not for the queens—the mothers? We old farmers realize that we cannot make the homes—did you ever try that?—without the tender touch of motherly care. And second in importance only to soil-building, comes home building in our work. To this we devote at all our meetings, a large period, under the title of “Home Economics.” In this way we touch the social part of the homelife, of the school, and of the church. You know my fellow farmers, those of you who live in Stroudsburg, and those who live elsewhere, that the average minister has not yet learned to pray for the farmer. He can pray for everything else, and can enter into other forms of commercial life, or of business life; but when it comes to praying to the good Lord to bless the harvest, it does not seem, in many cases, to meet the needs of the farmer, and it does seem as though it should be made a special study to learn how to pray properly for the farmer, and how the country church should be made to minister to the farmer. That country church should be made the centre of all the highest and best religious and social enjoyment. Without a good soil, a good home, and a good country church, there can not be a successful agriculture, and without a successful agriculture, there can not be a successful nation. If the nation is to endure, its agriculture must be successful, and to that end we are devoting our energies when we study these great problems that come up before us in these institute meetings.

Now, my friends, I did not intend to talk so long. You will observe by the hoarseness of my voice that I have been foolish enough to contract a little cold, so I am glad to call on our Secretary of Agriculture, who is with us, to relieve me, and address you, after which we will hear from a large man, with a weak voice, which you may possibly be able to hear if you listen. Secretary Critchfield will now speak to you. He has not very much work to do, having charge of the Department of Agriculture, of which this institute work is a bureau.

ADDRESS

By HON. N. B. CRITCHFIELD, *Secretary of Agriculture*

Mr. Chairman, Judge Staples, Burgess Edinger, Ladies, Suffragettes and Gentlemen (I guess I have concluded you all): I think you will agree with me that Mr. Martin is taking advantage of my extreme youth in calling me out in this way, and it is not right.

Mr. Martin says I have charge of things, and don't work. Well, it takes some one to be at the head of things, and look after them, when there are so many bureaus; he has charge of the educational work. Then there is the Bureau of Economic Zoology, the Pure Food Bureau, the Livestock Sanitary Board, and various other forms of activity in the line of agriculture, all come under the department of which I am the head. Some one must take care of the machinery, and see that it is oiled, and that it will do good work, and that is my work.

I came up here to attend a meeting of the State Board of Agriculture, which met this morning; and yet, I am interested in this educational work. You have heard of the institutes, and of the number of farmers that were in attendance at the Institutes last winter, and of the character of the instruction that was given. The Department always tries to get good men for this work, and when these men talk to you they are qualified by experience, and have worked out these problems on their own farms. And by the grace of the last General Assembly, there have been added to the list of our instructors, Advisers, who will go out on the farms, and into the homes, and look at the problems as they present themselves in each individual case, and give the necessary instructions to overcome them.

We are glad to have the State College, with its Experiment Station, and the great Federal Government, with which to work in conjunction, and look to for advice and assistance in working out some of these problems, and by grace of the Congress of the United States, men are now being sent out to study out new spots in which to grow new crops, and to go into foreign lands to find new crops that can be raised on our American soils. Our State Department, as Mr. Martin has already said, stands ready to co-operate with all these forces that tend towards the success of agriculture, and also to help the individual farmer solve his own individual problems.

I am glad to hear Judge Staples refer to the production of the crop of boys and girls on the farm. In order to make good farms, we must have these boys and girls just as well equipped for their work on the farm, as are the boys and girls in the cities for their work. We want them to understand the relation they sustain to their fellows: we want them to understand not only the Fatherhood of God, but the Brotherhood of Man, and the relation they sustain to their brother men, and the relation the farmer sustains to his fellows. We want them to know that they are not only the equal of their fellows, but that the other men look to them for sustenance. We want them to have that feeling of brotherly kindness to their fellow men that is shown in the story of the man who went down from Jerusalem to Jericho, and was beset by robbers and beaten and robbed of everything he had, and whom the Jew and the Levite passed him by in his distress; but while he lay there half dead, there came a Samaritan riding down the mountain, and notwithstanding that there was no communication between the Jews and the Samaritans, this man dismounted from his beast, and ministered to the poor man, and when he had revived him sufficiently, set him on his own beast and led him to the inn, where he paid the score, and told the landlord to care for him, that he would pay anything extra there might be when he came back. We want to teach our boys and

girls, not only a religion that ministers to those who have fallen by the way on the road to Jericho, but we want to teach them how to make the road to Jericho safe, and to take and keep the danger out of the way of those who might otherwise be tempted to stray out of the paths of rectitude and duty.

Now, Mr. Chairman, I don't know that I have anything further to say, and I am ready to turn this over to the small man from Tioga.

RESPONSE TO THE ADDRESS OF WELCOME

By E. B. DORSETT, *Farm Adviser, Mansfield, Pa.*

Mr. Chairman, your Honors, Members of the Institute, Ladies and Gentlemen: I deem it both an honor and a privilege to respond to the cordial words of greeting from the Judge of your Court and His Honor, the Mayor. We are here not merely as representatives of the greatest calling known to man, but as men and women actually engaged in the tilling of the soil. In coming here we do not bring with us any such exalted opinion of ourselves or claim to possess that degree of knowledge as was claimed by our friend Pat, who had been brought into Court, to be tried by a jury of his peers for some breach of the law. The jury had been called and the trial was about to begin, when the Judge turned to Pat and said: "Pat, do you know any of the jurors?" Pat replied, "Yes, Sor, I do, your Honor." "Do you know as much as half of them?" asked the Judge. "Yes, Sor," replied Pat, "I know more than the whole bunch of thim." We are here with the full consciousness of the fact, that while Agriculture is as yet but little understood by the masses, yet we have in a greater or lesser degree, been responsible for the progress that has been made during the last decade.

These men and women are here to discuss problems pertaining to the farm, the school, the State and the Nation. We represent the oldest occupation known to man. "Since God placed man on the earth, Agriculture has existed. There is no occupation precedes it, no other or association that can rank with the tillers of the soil. Before literature existed, before governments were known, Agriculture was the calling of man and all the fruits of social progress since then grew from the brown soil. Agricultural toilers, therefore, claim this precedence over royal dynasties and titles of nobility, that they represent the oldest and most indisputable lineage, and hold a patent that issues from the ancient gates of Eden."

Of the three men first mentioned in the Bible, one was a Grazier, one a Gardener and the other a Plowman. In after years these different occupations were united and today are known under the one name as Agriculture. In early times there was much drudgery connected with farm life, and the lot of the farmer was neither easy nor congenial. Most of the work was done by hand and the few imple-

ments that were used were of crude type. All seed was sown by hand and threshing machines were unknown. The ripened grain was cut with a scythe or a sickle and threshed with a flail or was tramped out by the treading of animals. Muscle and brawn ruled during the early history of agriculture, and farmers were not accustomed to do much thinking or planning to better their conditions.

It is stated that the early Roman farmer spent four and six-tenths days in growing a bushel of wheat, while in 1830 the same amount of wheat could be grown under improved hand methods with three hours' work at a cost of 17.7 cents. At the present time, under improved machine methods, the same results may be secured with only nine minutes' work at a cost of three and five-tenths cents. This wonderful change in farm operations, has been brought about by the introduction of improved farm machinery and the application of scientific methods in farming. Much of the drudgery of farm work has been eliminated and the cost of producing farm products has been greatly lessened.

The Romans gave much attention to farming, and many of their statesmen spent their leisure moments in the country. The poems of Virgil, Horace, and other Roman authors extol the virtues of country life and show the high esteem in which the farm was held. As long as agriculture occupied this high place of honor, and as long as they tilled their farms, they were a powerful people and conquered all nations. But as soon as the farms were neglected, the freemen flocked to the cities, and the powerful Roman nation began to decay and soon sank into obscurity.

It may be safely stated that every strong and sturdy nation known in history has been one in which agriculture has been the leading occupation. This is true of our own country and it would be well if our law makers would recognize this fact, when shaping legislation affecting agricultural interests. Our last Congress passed a tariff law, which compels the farmer to sell in an open market and buy in a protected one. The time has come, when the tariff should no longer be considered a political issue but a business problem. A Tariff Commission may not suit ambitious politicians, but it will best serve the needs of agriculture and protect the great industrial and financial interests of the country, A tariff for all or a tariff for none should be the slogan of every farmer.

We are justly proud of our industries, and realize that the fact that our railroads constitute the great arteries of trade and commerce. We recognize the fact that the natural resources of Pennsylvania are excelled by no other state in the Union. And yet, Agriculture is greater than any of these, and the value of its products nearly equals the combined value of all of them. It is an undisputed fact that the success of all business enterprises, for the welfare of mankind, depends largely upon the success of agriculture.

Such, in brief, is the character of the profession represented by the men and women assembled here today. We accept your hospitality and appreciate your words of welcome, and trust our coming among you will unite us in a closer brotherhood, and that when we have gone you will feel that we have scattered a few rays of sunshine across your pathway. Again, in behalf of my co-workers, and in the name of the State Board of Agriculture I thank you for your fraternal greetings.

ADDRESS OF PROF. STEVENS

Mr. President, I am glad you called on me for a few words, because I am hardly prepared to speak at this time; we have not yet been to the gas office.

I want to take this occasion to speak just a word or two on Agricultural Extension work as it is carried on by the various agencies that are engaged in that work. I don't like to flatter people. That is farthest from my make-up; but it is safe always to keep within the truth, and I can, therefore, say that I think the corps of Institute workers and their leader are to be congratulated for the type of work carried on by the type of men and women by whom it is being carried on in this State of Pennsylvania. It has been my privilege, in times gone by, to do work in other states of the Union. I have come in contact with agricultural workers in other states, and I have come into direct contact with them outside of their work, and I can say without stretching my conscience in the least, that the type you have here in Pennsylvania is second to none.

Now other agencies have come into the work. We have other State agencies; we have a Railroad Department of Agriculture, with which I am connected, and those of you with whom I have come in contact the past five years know that it has been my wish to work in conjunction with you, in the solution of all these farm problems, so that we may do all that is possible for the advantage of each other. That is, the railroad has been for some years in this extension work; it is not to come in conflict with your work, but to parallel it—to run alongside of it and in the same direction. As time goes on, and funds make it possible for this great work to be extended, I expect that our work will be more with you than in the past. In other words, our work will be to assist you who are doing this work in every way possible. To be explicit: we find conditions now facing us which we cannot dodge. One of them is the extension of our work into Federal legislation. That is effective in New York State, and it will be in this State, by the appointment of so-called "County Agents." We want to work with them. We have placed these county agents on our pay roll, where their work adjoins ours, in New York State, for a nominal sum, and extended to them the courtesy of transportation and a free use of our wires.

MR. SEAMANS: How much do you pay them for a month?

PROF. STEVENS: Five dollars a month—merely a nominal sum and we have fertility tests, seed tests, etc., for them. Now we want to extend to the workers of this State the same privileges that we do to these County Agents; we want to keep in touch with them more than we have in the past, in the performance of this work.

Some question has been raised as to the reason for our interest in this work; most of you here know what this work is. We have got in touch with the purchasers in other lines of business but until recently we have not come into contact with the farmer. The pros-

perity of the railroads is dependent upon the amount of freight they carry, and this freight consists not only of manufactured articles, but of crops; the more prosperous the farmer is, the more crops he will have to be moved. This may not be a very high motive—it may be a selfish one, but at the same time, it is a business proposition, and we have learned a good many things by coming into contact with the farmer and his problems, and it may be that we, on the other hand, may be able to teach the farmer something, of which you now know nothing. We are always ready to co-operate with you, and to do our best to help you solve some of the problems which confront you.

BEEF PRODUCTION IN PENNSYLVANIA

By PROF. W. H. TOMHAVE, *State College, Pa.*

Ladies and Gentlemen: I am sorry to be late getting to this meeting, but it is not entirely my fault. The train was a few minutes late getting into Stroudsburg and I also felt that it would be better for me to go to the hotel and get rid of some of the coal dust and cinders which were picked up by me coming through the coal regions during the forenoon. Even though I am late, I see that you have been well cared for so far as material for discussion is concerned.

The subject assigned me for discussion is that of "Beef Production in Pennsylvania." This is a subject that a few years ago would have received very little consideration at a Pennsylvania meeting. Conditions have changed, however, so that at the present time this subject is given the consideration it deserves. The reason for it no doubt is the present high price of meat, the comparatively high price of finished cattle on the market and the high prices paid for feeders during the past two or three years. These conditions have created considerable interest in beef production, not only from the producers but from the consumers as well. I believe these conditions make it a worthy subject for consideration in the State of Pennsylvania.

The first question that possibly arises is, "Why are we interested in the problem of beef production in Pennsylvania?" I might say that the principle reason for it is that it costs a good deal of money to buy meat; it is expensive to buy feeding cattle and the feeds on our farms such as are consumed by cattle in the feed lot are given a high value. We are also confronted with a shortage of beef cattle such as has never been known in the United States or the meat producing world. It is going to be difficult and it will take time to overcome this shortage. The reason for the shortage of our beef supply is due, in a large measure, to the fact that the production of beef cattle has materially fallen off during the past five or ten

years and has not kept pace with the increase in population. This is not only true of the United States, but also of the rest of the meat producing world. We find that during the past ten years the population of the ten leading meat producing countries in the world has increased 9.9 per cent., while that of the supply of meat animal has increased only 2.18 per cent. This, to my mind, is one of the reasons why beef cattle have ruled high during the past few years and I believe will continue to do so for some years to come. The difference between production and increase in population is much greater in the United States than any other country in the world. Since 1909 the population of the United States has been increased by about 2,000,000 while the production of beef cattle has been decreased from about 52,960,000 to 36,060,000, or practically 30 per cent.

One of the questions that confronts us today is, "Why has Pennsylvania been on the decline as a meat producing state?" One of the first reasons is that the farmers of this State felt that it was impossible for them to compete with other sections of the United States in beef production. This, combined with the increase in the cost of labor, the price of farm lands and grain, made them turn their attention to other lines of farming. We all know that a number of years ago Pennsylvania was one of the leading beef producing states in the Union. This time is possible within the memory of some of the men present today. As the tide of immigration moved westward from this and other Eastern states, it became necessary for the beef cattle industry to move ahead of it. The rapid increase in population in other sections of the United States, and especially that of the Far West, has materially changed conditions so far as beef production is concerned. The cost of producing beef cattle in Central and Far West has reached the point where it again is possible for the Eastern farmer to compete with other sections of the United States. The thousands of acres of cheap grazing lands in the West no longer exist. Many of these regions have been under cultivation and are used for the production of crops of one kind or another. The price of former cheap grazing lands has reached the stage where it can no longer be profitably used as grazing lands. All these changes will make it necessary for the production of more beef cattle on small farms. Since these are the conditions which confront us today. I believe it is again possible to produce beef cattle in many sections of Pennsylvania and do it at a profit. We should also keep the fact in mind that the State of Pennsylvania has lost none of its natural advantages for the production of beef which it possessed more than a decade ago.

I stated a few minutes ago that beef production was most profitable where there is grazing lands; land that cannot, or at least should not, be tilled. The State of Pennsylvania has a great deal of land of this character, possibly half of it. I now refer to the rough and hilly sections of the State; and as we travel through Pennsylvania from one end to the other we find many places where farmers are trying to cultivate the hillsides which, if devoted to the production of beef cattle, would yield them better returns with less trouble than they are doing at the present time.

One of the problems which naturally confronts the Pennsylvania farmer, is the price that is to be realized from his cattle, whether the price is such as to make it worth his while. I recently reviewed the prices paid on the Chicago market and found that they had been

steadily on the increase since 1885. Grouping the market prices by five year periods we find them from 1886 to 1891 the price paid for all classes of beef cattle on the Chicago market was \$4.06 per 100 pounds; from 1891 to 1895, \$4.13; from 1895 to 1900, \$4.56; from 1900 to 1905, \$5.13; from 1905 to 1910, \$5.80; from 1910 to 1913, \$7.30. This shows that during the past few years the price of beef cattle has materially increased and the price is such as to make it possible to produce beef cattle on the farms in Pennsylvania. The decided increase in price on the Chicago market during the past three or four years is a true indication of our present shortage of beef cattle, and it seems to me that it is up to the Pennsylvania farmer to at least try and help solve this shortage.

Some people seem to feel that the United States has reached its maximum capacity for production. I do not believe that this is true. I believe that we are capable of producing many more beef cattle by adopting a better system of farming. Such system of farming will also make it unnecessary for us to import beef cattle from Argentine or Canada. It is true that we are importing a small amount at this time, but the quality of meat that comes into this country is not good enough to compete with that which we are capable of producing. It is true that these small importations, together with industrial depression, has had a demoralizing effect upon the beef cattle market during the past few months. I believe that this will be overcome and that we will again have a healthy market for beef cattle in a comparatively short time.

Besides making use of the large amount of waste lands in the State of Pennsylvania, it is important that our farmers produce a better quality of beef cattle than they are doing at the present time. Many of the beef cattle that are now bred and fed in this State are inferior in quality and are not the most economical kind to feed. We must not only consider the better type of cattle, but we must study the methods of feeding and try to make beef more economically than we have in the past. The high price of farm feeds makes this necessary. Twelve or fifteen years ago very little consideration was given the economic side of beef production. There are very few experiments that were conducted prior to 1908 that even considered the cost of producing 100 pounds of grain. The cost of production today is one of the most important items to consider. This means that the cost of farm lands, as well as cost of feeds used, are important considerations. The Eastern part of the United States, and especially Pennsylvania, has an unusual advantage in this respect when it comes to the cost of production. We have an unusual amount of natural rough and hilly grass land that is admirably adapted to grazing. In the western part of this State there are many thousands of acres that are unequalled for supporting beef cattle to advantage. Much of this land today is complete waste and giving no returns to its owners. Grass is the cheapest form of feed that we can get for cattle and the best returns are made where cattle can be grazed providing the land is not too costly. This is indicated by the condition of the cattle from the blue grass regions in many sections of Pennsylvania. Grass cattle have come to the Pittsburgh market from southwestern Pennsylvania in the fall of the year equal to the short grain fed cattle from Ohio and other states.

We have another advantage that should not be overlooked, namely, that of our annual rainfall. The annual rainfall for the eastern part

of the United States is from 35 to 40 inches while that of the middle section is 25 to 30 inches and the Far West 15 to 20 inches. This shows that the East has practically double the rainfall of the extreme West and 50 per cent. more than the Central West. This gives the farmers of Pennsylvania an advantage that is not enjoyed by the farmers of the western section of the United States. Climatic conditions are such as to make it possible to feed any time of the year. Our winters are not severe enough to interfere with cattle feeding.

Another important factor is that of markets. Proximity to desirable markets is essential. Nearness to market means the paying of less freight as compared with the central and Far West, when it comes to getting our meat products to the consumer. People in Pennsylvania have a market that is unequalled for taking things that are produced. There is a ready market for the fancy steer as well as the common cutter and canner. This does not mean that everything produced is done at a profit, but it does mean that the market is ready to take a saleable product from the hands of the farmer.

Another feature that should be kept in mind in making use of our rough and hilly lands is that it will equalize our farming operations. It will be easier to till the farms in the State. If more farmers would devote their time to cultivating the level or sloping lands and getting the rough land in a permanent pasture the net returns from the farms would be increased. The tillable lands could be more intensely cultivated where livestock would bring in the returns from the rough and hilly sections. It will also make it possible for the average farmer to work his farm with less labor than is the case at the present time.

In the production of beef cattle it is important that we have animals of the beef type. We have two distinct classes of cattle, one that is bred for milk and the other for beef. If you are going into the beef business and expect to do it at a profit go at it in an intelligent and business like manner. Get a foundation of good beef blood. If your means will not allow the purchase of all pure bred get some good grade beef cows and purchase the best pure bred sire that is obtainable. The farmer who takes hold of this proposition in a business like manner cannot afford to waste his money on scrubs or mongrels. If our farmers can be induced to dispose of these "star boarders" it will mean more money to them and a better class of cattle on our farms. Many farmers feel that they cannot afford to pay \$150.00 or \$200.00 for a pure bred bull when they have only 15 or 20 cows on the farm. If such is the case it is desirable for two or three farmers to go together and purchase a pure bred sire for their service. Such an investment will be one of the most profitable ever made in a community.

In breeding beef cattle, the cost of production is an important item. This is possibly one reason why many of our beef breeding herds have been reduced during the past 10 or 15 years. The question that now confronts us is whether it pays to keep a cow, for the calf which she will produce. It is possible to do so if the cow is economically fed and if breeding cows of the desirable type are fed. In order to do this it will become necessary however for the Pennsylvania farmer to feed his cows almost entirely on roughage,

of which an abundance is produced in this State. He must keep down the cost of feed, labor, and shelter. If this is done it will be possible to maintain a herd at a profit. To determine this point an experiment was started at the Pennsylvania Experiment Station in the fall of 1911. Ten pure bred Aberdeen-Angus and 10 Short-horn cows were put on the experiment. We now have data covering two and one-half years' work which give us some idea of the cost of maintaining a beef cow under Pennsylvania conditions. In starting this experiment it was realized that a cheap feed of some kind must form the principle part of the ration. Corn silage was selected as the principal feed. It was believed that the farmers in nearly every section in the State of Pennsylvania were able to produce corn silage for feeding purposes. In addition to all the corn silage these cows would consume daily, they received one pound of cottonseed meal per head daily. During the summer months they were kept on blue grass pasture. The table which I have here will give you some idea of the results obtained up to the time the cattle were put on pasture this spring:

DECEMBER 1, 1911 TO APRIL 26, 1914

	3 Winters.	2 Summers.
Average length of period,	154.3	206.5
Average initial weight per cow,	1161.18 lbs.	1209.83
Average final weight per cow,	1233.87	1250.94
Gain,	72.69	41.11
Average daily feed per cow:		
Pasture,		
Corn silage,	58.26	
Cottonseed meal,	1.00	
Cost of feed per cow, season,	15.77	5.60
Cost of bedding per cow, season,	4.32	
Cost of labor per cow, season,	2.35	.76
Value manure per cow,	7.28	
Interest on value per cow,	2.31	3.10
Interest on sheds and silos,	1.50	
Service of sire, .....	.75	.75
Net cost of cow,	19.72	10.21

FEEDING STEERS, 1913-1914

	Lot 1	2	3	4	5
Ration,	Mixed hay, corn stover bran, corn (ear) corn and meal	Silage, cotton- seed meal, corn	Silage, alfalfa corn	Silage, cotton- seed meal, corn, mixed hay	Silage, cotton- seed meal, corn
Initial value per cwt.,	7.45	7.45	7.45	7.45	7.45
Initial weight,	10916	11003	11118	10003	10960
Total gain,	2855	3085	2690	3152	3098
Average daily gain, 140 days,	1.69	1.83	1.72	1.87	1.84
Total cost of feed,	\$363.56	\$312.37	\$283.92	\$333.54	\$343.40
Cost of roughage,	\$100.89	\$108.97	\$152.49	\$128.34	\$141.56
Cost of concentrate,	\$282.67	\$203.40	\$131.43	\$205.20	\$201.92
Cost per 100 lbs.—56 days first,	\$11.82	\$6.52	\$7.02	\$8.64	\$8.23
Cost per 100 lbs. gain last 84 days,	13.43	10.12	9.82	10.53	11.08
Value of pork per lot 8½c,	13.22	18.48	10.17	21.20	18.48
Necessary selling value,	8.69	8.03	7.93	8.13	8.25
Rated value at Pittsburgh,	8.30	8.30	8.15	8.40	8.25
Gain or loss per cwt.,	-39	+27	+22	+27	.....

MR. FENSTERMACHER: Is that all the roughage they received?

PROF. TOMHAVE: Yes, sir; and blue grass pasture during the summer. Corn silage was figured at \$3.50 per ton and cotton seed meal at \$32.00 and \$34.00 per ton. In the winter, the labor amounted to \$5.60 per head; through the summer it was practically nothing.

We permit the calves to stay with the cows until they are from six to eight months old. A good beef calf that weighs four to five hundred pounds, is worth more than thirty dollars today. The average weight of our calves at the time of weaning is from four hundred and fifty to five hundred pounds, such a calf is worth more than enough to pay for the cost of maintaining the cow.

It is true that there are other things to be taken into consideration. We must eliminate the cow that does not produce a calf, then figure only from seventy to eighty per cent. of calves, so that the cost of maintenance will probably be over forty dollars. On the other hand, we are using a crop that would otherwise be unsaleable and we find a ready market for an unsaleable product. I believe that it would be advisable to add a small amount of hay, say mixed clover hay, to the roughage, yet we have been able to observe no ill effects because of its absence. The calves that these cows produced were all healthy and vigorous. It is true that some of the cows get a little thin when they are nursing their calves, but that is to be expected.

You will notice that we have made no allowance for depreciation in value in this experiment. We have sold several of these cows and obtained a good price on the Pittsburgh market. Cows weighing twelve hundred pounds and fat will bring between seventy-five and one hundred dollars.

One of the questions that comes up in the minds of many of our Pennsylvania farmers is whether or not it pays to feed beef cattle. In answer to this I might say that we kept an accurate record of the cost of feeding 178 head of cattle that were fed in an experimental way at the Pennsylvania State College from 1908 to 1913. During this time these cattle returned to the college an average profit of \$5.00 per head after paying for the feed consumed. They returned to the college 98 cents for every bushel of corn consumed. Some years the cattle were fed at a loss while other years they made a substantial profit. The man that expects to make money feeding cattle must feed every year so as to be on the market with cattle the good years as well as the poor years. I question very much whether there is a farmer in the State of Pennsylvania who received 98 cents per bushel for all corn sold from the farm during this time. Besides receiving this amount for the corn consumed a market was found for a large amount of other products such as hay and silage that could not have been sold to advantage. The fertility is also returned on the farm.

CLUB ORGANIZATIONS FOR THE COUNTRY GIRL.

By MRS. LINN J. CRAWFORD, *Cooperstown, Pa.*

"Uncle Sam" has a large and ever-increasing family; his care and his devotion to its welfare is increasing. He has been especially solicitous of late years for us, who are the inhabitants of the rural districts. The farmer is taught the best means of farming by lectures, demonstrations, and bulletins. The farmers' wife is not forgotten; she profits by her share of the instruction, and makes better butter, is more successful with her poultry, and is becoming reconciled to her new labor-saving machines. The boy has been interviewed, exhorted, coaxed, and bribed to stay on the farm, and finally the farm girl comes in for her share of the attention, and clubs are being organized for her benefit. After all, the girl is the important member of the family; the mistake "Uncle Sam" made was not to begin with her in the first place; organizing clubs for her benefit is the master-stroke of his policy, for I assure you, if by this new plan of education he can persuade the girl to stay on the farm, the problem is solved regarding the boy.

To educate our girl in the best sense of the word, we must give her the opportunity to become such a woman as the inspired writer pictures, whose price is "far above rubies"; who "looketh well to the ways of her household"; whose "children rise up and call her blessed"; whose husband "praiseth her." We must see that she develops along the lines that insure character, poise and culture. We do not know what powers lie dormant in her mind until we try to develop them, and the more highly developed each faculty becomes, the greater the increase of her power and skill to do well her life work.

The object of education is to develop the power of attending to the right things in the right way. To teach the girl, we must bring her mind into contact with that which has educational value, but the subject must be made interesting to her, for without her interest we can neither get her attention nor keep it; but with work that is congenial to her tastes, the hours of labor speed profitably and happily by.

Many reasons are given for the country girl deserting her home for what looks to her the greater attractions and advantages of the city. No use to tell her of the meagre wage, the hardships, the drudgery, the little hall bedroom, the unwholesome food and insufficient meal, and the many temptations she will encounter. All she thinks of is escaping the ceaseless monotony and round of toil that does not satisfy her youthful aspirations. The *real* reason she leaves the farm is because she has no vital interests there. You may think she is interested in the things you are; you remember the old adage you were raised on, "Satan finds some mischief still, for idle hands to do," and you proceed to give her work, regardless of her inclinations as to kind. She may uncomplainingly wash the dishes three times a day if she is a good, dutiful daughter, when the soul within her loathes the very sight of a dish-pan, and rebels at the thought

of the disagreeable duty; yet give this same girl a plot of ground she can call her own, and all the flower seeds she wants to plant, and she becomes an industrious and interested person, her body growing strong and vigorous from the use of the hoe. Or give her the choice of some fancy material for a blouse, some bits of lace and pretty ribbons. In this work her inmate sense of beauty is being gratified, while her fingers are becoming deft in the use of the needle. What the girl needs is a special instruction along the line of some congenial employment that will occupy her mind, satisfy her tastes, and keep her fingers busily employed; something supplemental to the general education acquired during the winter term of school; some definite thing that she, of her own volition, chooses. Should she join the country club organization, she can have the full liberty of following the bent of her inclinations in choosing her work, and she cannot go amiss, as all the club studies are made interesting and alive by the efficient helpers in the State force of instructors whose duty and pleasure is to assist her in all that tends to her best development.

The club work teaches a girl to rely upon herself and her own resources, and as the American girl is working toward independence, and the ability to be self-sustaining, it opens up a way; given ideas, she will work out her own ideals. It is a well-known fact that every idea seeks to realize itself in action, to get itself carried out by the physical organism. Club work is prolific in ideas; the girl will grasp them and carry on her work first for the pleasure and profit of it, and then because she realizes that through it she is serving her fellow-beings; it is not now the old monotonous round of eating, working, sleeping, saving for no particular purpose that could be discovered by the girl, but it is eating wholesome things raised by her own hand, working to a definite purpose, saving to spend and enjoying each day more fully the results of well-ordered living.

Life seems to give superior advantages to the city girl. The wider social experience does give her more of a knowledge of people and things. The isolated life of the country girl tends to an individualism which retards the growth of her social nature. Country Club work is the remedy for this; it gives something for a whole neighborhood of girls to have in common; sociability is created and fostered by club meetings where plans of work and methods are discussed; the good-natured rivalry inspires and stimulates in the girl a desire to excel; the telephone, parcel post, and good roads are all conspiring with the Country Club to give the farm girl equal advantages socially and intellectually, with her city sister. The only complaint of those who have been promoting this Country Club work is that it is hard to get the country girl to take the initiative, and push the work along. Those who go to the higher schools of learning and are especially fitted to take the leadership, seldom settle in the country. There is plenty of natural ability left, but because of lack of training in that direction, there is a hesitancy to assume the responsibility of organization and management of a club. Once started, the clubs themselves will develop a working leadership among our girls and women, so this must not prove discouraging to us. One way to help develop the quality of leadership is to make the farm girl feel her importance, not only her importance on the farm to

help make a cheerful home and comfortable housing for the family, but her importance to the community of which she is a part. Let her learn of her city sister social worker that some of her life should be devoted to the welfare and social uplift of her own neighborhood. She should help build up the appreciative qualities of life; she should use her influence to counteract the narrowness and the habit of paying attention to trifles that our rather isolated and individualized life has developed in us. She can do much to make her associates feel that as farmers daughters they are part of a large social class that has worth and dignity, that their work is honorable and their future promising, and that the country has attractions that are peculiarly its own, and together they will discover and enjoy them. She should see that good reading matter is in circulation; such reading as will keep the neighborhood well informed on all the political, religious and social topics of the day, that there will be no dearth of interest in the conversation of the social gatherings, because these topics will dislodge all personal matters, or a desire for small talk. Such an influence in a neighborhood will have a tendency to give an uplift of soul, and a sense of joy and satisfaction in life worth the striving for.

In this Country Club Organization the girl learns to work to systematically and scientifically. Take, for example, the raising of tomatoes: she will learn to manage a hot-bed, or cold frame; she will learn the best type of tomato to grow; how to plant, cultivate, spray, fertilize, stake and prune. She will learn something about the soil she has to deal with, and the length of the tomato season; she will learn how to harvest her crop, how to sell, and the best method of preserving her surplus crop for winter use. Finally, she will learn, in forming her little booklet of 'How I Made My Crop,' confidence in her own abilities; she will learn expression, accuracy and neatness. Painting the title page will bring out any artistic tendencies she may possess. After such a training as this, no girl would want to go back to the old slipshod, hap-hazard way of doing things; her mind has had a discipline which will enable her to choose what she shall do, to concentrate her thoughts upon her work, and to use her intellect as well as her hands to such advantage that her work cannot but be successful. One of our humorists has said, "Nothing succeeds like success." She will find this true.

The giving of prizes in this Country Club work is a most commendable thing, as it not only stimulates a girl to do her best, but can be made a means of further education. Cities are becoming each year more interested in the work of the rural communities, encouraging the workers by arranging places of exhibit, supplying money for prizes, and in every way possible co-operating with the federal agents in the advancement of the work. Among the larger prizes are trips to the State capital or to Washington, and what country girl would not like such a trip, when they are housed in the best hotels, taken to places of historical interest, to theatres and through the various government buildings? A year at a State College is also a prize worth contending for, as that would mean a course in Domestic Science, or any branch of study the girl may choose of the studies furnished by the College. Last year fifty thousand girls were enrolled in the Garden and Canning Clubs of the United States. Think of the number of girls made happier in them-

selves, and more valuable to this and the next generation through this great work, and contrast this with the fifty thousand girls claimed by the "great, mysterious world of oblivion"—fifty thousand who simply dropped out of existence.

We can safe-guard our girl by giving her active and intelligent occupation for her hand and brain; by providing a cheerful and comfortable home; seeing that she has recreation of a suitable kind, and proper social environment; by giving her a wholesome view-point from which to look at life: from this view-point will come a wholesome living that will insure the girl the greatest contentment and satisfaction that this life has to offer.

SCHOOL HYGIENE

By MISS ELIZABETH HUGHES CONARD, *Westgrove, Pa.*

Ladies and Gentlemen: This may seem a peculiar subject to come up at a meeting like this, but I want to give it to you as parents and School Directors, from the view point of the mental and physical development of the child.

It is impossible to get the best returns without the proper sanitary appliances. This is from a financial standpoint. It refers to everyone who pays school tax. School tax is nothing more or less than an investment, according to how it is spent. If it is spent in good equipment, good surroundings—and by "good" we don't mean elaborate, because elaborate appliances are rather a detriment than otherwise—but when your school tax is well spent it brings you home as good results as any investment you can make. If you have invested it poorly, then we have the other side of the question. If your equipment is not of the best, the development of the child is slow and he cannot do his best work, and the return is necessarily small for the amount of the investment. The health and vigor of the nation depends very largely upon the foundation we have laid in school life. We cannot keep the child cooped up in an unsanitary room with poor air and uncomfortable seats, and get good results in after life. We lay the foundation in the school room, and as that foundation is laid, so will the after life of the child be. Upon the foundation is built the whole structure of the child's life. It is estimated that a child between five and ten years of age, is worth to the State \$950; between ten and twenty, two thousand dollars, and between twenty and thirty years, four thousand dollars. The average value of life of all ages is worth \$2900. Now every time we put our pupil in a school room with unsanitary surroundings, we are risking an actual monetary loss; we lessen their earning power, and reduce their value. Now, it is of little value without bodily vigor, to endeavor to impart education. No doubt you think of many men who with a poor body have accomplished great things, but even

they have not done what they might have done, had they had a stronger physique. Hence we must see to it that we have the best buildings, the best surroundings, the best equipment, to produce and maintain the health of the child.

Some of the chief dangers in the school are, poor light, poor ventilation, and the dangers that come from contact with other pupils, which may to some extent be overcome. There we have the danger of contagion and infection. Now, how can you, as citizens, overcome these difficulties? Many of these things belong directly to the directors and teachers, but they are not overcome unless you, as citizens, know your rights and insist upon them. Dressler, one of our best authorities on teaching says, that no mental training is complete which overlooks the training of the body as well.

Now suppose that in your community you are going to remodel your old building, or erect a new one. The same thing applies in both cases. Now what are some of the things which you, as citizens, should consider? The first thing is the site. Where should you place it? Preferably near the centre of population, but with our improved means of travel, this is not so important as it once was. It should be on a reasonable elevation because of the drainage, because of the ventilation, so that you can get away from the dampness. You should purchase sufficient ground for a playground, so as to provide for the physical development of the pupil. I think the best authorities allow about thirty square feet of space to each pupil. When purchasing, you should look into the future and take into consideration the necessary changes that will come in a growing community. The length of life of that property and the security of your investment will depend upon how long that property is available for the purpose for which it was intended. You should know how long it remains useful.

Then of what should you build your building? Preferably of brick or stone. It is practically fire proof, and stands the stress of storm and time, and is probably more satisfactory than anything else. Every building should have a basement. Now, in the country, where there is plenty of room to spread out, why go into a basement? It is needed for ventilation, needed for warmth, needed to keep out the gases and to keep the air dry. It should be at least ten feet high to sustain a sufficient current of air. It can be used for storage purposes, and for a play ground in bad weather.

How many stories should you have? That depends upon the value of ground where you purchase. In cities, we have to go up. In the country there is seldom necessity for more than two. If you increase the height, you also increase the fire danger, and the noise of the children in going up and down stairs.

Now we get to the most important part of the building, and that is to the school room itself. Unfortunately, most of our buildings have been planned for four large rooms, and then divided accordingly. Calculate on how many rooms you will need in the life of your school, and then get the best light possible, and cut your windows accordingly. The school room is the place where the child spends most of the time, so every care should be taken to make it as comfortable as possible, and to have the best possible light. It should not only be light, but it should be sanitary and well venti-

lated. The plainer the better; little or no carving or anything that will catch and accumulate dust, and make trouble.

What size shall the school room be? Not large enough to accommodate more children than one teacher can handle. The law requires twenty square feet for each child, and also thirty square feet of air space. Twenty by thirty by twelve and a half or thirteen feet will accommodate twenty children very nicely, with a little more than the exact amount of air and building space required by law.

Then the subject of lighting the school room, which is a very important question. The law forbids that the light should come from the front. Unfortunately we find it does, in a good many cases, and the child sits all day with the light shining directly into its eyes. The light should not come to the right, because then the child works all day in the shadow made by its hands, and we know that a shifting or moving shadow increases the accommodation of the eye, and is therefore injurious. The light should never come from the back, but there should be five or six windows beginning far enough back not to throw the light in the eyes of the child. If, for any reason, it is impossible to get enough light from the left, some light may come from the right, but never enough to overcome the light from the left. It should not be low enough to strike the eye, but it should go up to the ceiling, where it shines on the ceiling and falls as a diffused light. There should be no arches, because valuable light space is lost. Then, use large panes; small panes throw shadows, and the loss in light space is equal to 20% of the entire light space.

The walls should be plain, or painted with an unglazed paint. Wall paper absorbs gases; paint is cleaner and more sanitary. There should be plenty of blackboard space, but nothing between the windows, so that the child will get the reflection in the eye.

What about the furniture of the room, and the desks and seats? The seats and desks should always be adjustable. The child spends many hours each day sitting before the desk. If they are too low or too high, we get a position that will, in time, spoil the health of the child. If they are too high, the shoulders are up, and the head in a bad position, and it is hard on the eyes. When the desk is too low, the body leans forward, the spine is bent, the chest is cramped, the stomach is cramped, the circulation is interfered with, and the digestion more or less stopped, and we wonder why the child does not thrive, and we begin to look at home for the cause, when it is due to the position that the child holds for several hours at school. If the chair is too high, we have the same position as if the desk is too low. Your desk and your chair should be made so as to be made or lowered so as to suit the child. The top should be made so that the incline can be changed. There are several desks now so made, and they are not expensive. One of the dangers of the poor desk is to **the** eyesight. Dr. Cohen finds that at nine years 3.5% of the children are near sighted; at ten years, 20%; at eighteen years, 30%. The longer the time spent at school, the more of them become near sighted. The majority of children are born far-sighted.

Another question for us to take into consideration, is the plan of heating. How should our room be heated? Some of our rooms are under-heated, some are over-heated. It depends somewhat upon the age of the child, but an average temperature of 68 to 70 degrees

would probably be about right, on the whole. In the cities this is more readily accomplished; in the country, the school is very apt to be heated by a large stove. This stove should have a jacket, and if it is properly done, it can be so arranged that we can get ventilation from the stove. The stove should not be in the middle of the room, but in a corner. Under it there should be a duct to bring in fresh air from the outside; round the stove should be a jacket. This air goes up into this jacket and rises to the ceiling after it has been warmed in the jacket, and is there diffused.

Every school room should be equipped with a cloak room, where each child should be given a separate locker. Many children come in from homes that are improperly ventilated, while others come from good clean homes, and they should not be required to hang their clothes where they come in contact with the clothing of children from the other kind of homes. Many of the diseases are carried in that way. Therefore each child should be given a separate compartment.

There are other dangers that come in from the home and from the school. One is in the drinking water. I think there are schools where the water is carried in a bucket, brought in and set in a poorly ventilated school room, and a common drinking cup used by the children. Tuberculosis and other dread diseases can often be traced to the use of the common drinking cup. Because we cannot reach every home, and some of them are not sanitary, the teacher should be careful. At the first symptoms of any sickness, the teacher should send the child home, and not permit it to come back except with a doctor's certificate; and when a child does show any symptoms of any contagious disease, whether measles or something else, the school room should at once be disinfected. The cost will be small compared with the cost of checking the disease afterwards.

Then we come to the question of recess. These children sit in uncomfortable seats for hours at a time, often without any change or relaxation except at the noon hour. Many grown people are incapable of concentrating their attention on a given subject for more than twenty minutes at a time; we should not expect it of the children. Let the children get out into the fresh air for a short time during each session, and you will soon see better results in their work; or give them several little recesses or a few minutes' gymnastic exercises. Any teacher who thinks he or she cannot spare the time, will find that even though it seems impossible to spare the time, it will be well spent, and the better work the children do as the result of it will more than make up for the time that is taken. It does not take more than three or four minutes to open the windows and get better air, and during that time give them a little gymnastic exercise. They will all be the better for it mentally and physically.

Your room should be thoroughly cleaned each day and the dust wiped off afterwards with a dampened cloth, so that it will not fly round the room. The relation between physical health and conduct is very close. The preservation of health is very closely connected with character building, and in order to make good citizens we must look after both the physical and mental health of the children.

“LITTLE THINGS.”

DR. HANNAH McK. LYON, *Lincoln University, Pa.*

First of all, Madam President, I wish we could go on with the talk on school, because I think it is one of the most valuable talks we will hear. And Mrs. Foulke is also to talk on such an important subject; but I wish we could have a full and free discussion of this school question; it is of such great importance. Nevertheless, we must take up a smaller subject, and emphasize the importance of “Little Things.”

We must learn how to take care of the little things. If we take care of the minute, the hour will take care of itself. Again, there are letters to be mailed, but the great United States Postoffice Department, when there are three letters to be mailed, does not make it three for five, but insists on the extra penny—three for six. The letter must have that little stamp on it, or the carrier cannot take it when it is dropped in the box. If we take care of the pennies, the dollars will take care of themselves.

Then that little school out in the country. There was just an open water bucket, and a little child with a little cold, drank out of the common cup, dipped in that water bucket—nothing of any consequence; but within ten days nearly every child in that school is at home with tonsillitis, and sometimes it develops into something serious. Don't let any one speak of “a little cold.” If we cannot get away from this open water bucket, let us train our children about the necessity of having each one its own drinking cup, and using it only itself. Only, even then, it does not always work out our way. My little girl came home one day and said, “Teacher drank out of my cup today.” Now, I didn't want to say anything against the teacher, so I waited until the next day, and then asked, “And who drank out of your cup today?” “Oh, Lilly and Jim and Howard” and friends, Lilly and Jim and Howard were *colored* children and they drank out of *my child's* drinking cup! At that time there were scarcely a dozen people who realized the importance of the individual drinking cup, but the next year we had a teacher who was alive to the necessity of this very important thing; and she not only saw to it that each child had its own drinking cup, but there was a little cup with a handle by which to hang it up, to dip the water out of the bucket. That was three years ago, and still the children forget unless it is impressed upon them again and again. You would think they would remember; but they do not. It would seem a very little matter for the patrons of the school to furnish a closed water cooler, but they soon get out of order, and it takes a great deal of water to keep the tiny brains working, and so we do not do it.

Again, it is just a little piece of linen, called a handkerchief; it fluttered on the floor, and the germs fluttered in the air. Next day the child was at home with a cold. It got worse, and the doctor came and looked at her and said “take care of her.” The next thing some one else in the family had “just one of those grippy colds.” A

little more care was taken, but the next thing another member of the family, and then another, takes that "grippy cold," until the whole family has it; and then, perhaps, a neighbor comes in, and goes home with it. And it all goes back to that little piece of linen, called a handkerchief, that was dropped on the floor, and the cold that was not properly cared for in the first place. I wish we could learn to use our old muslins, when there is a slight cold, and then burn them before they are dried. If we must use handkerchiefs, they should be put in a basin by themselves with some disinfectant, and then brought to a boil before they are put in with the wash; then perhaps you may safely wash them, but I wish you would just use old muslins and then burn them.

There is an epidemic of typhoid fever in town, and the milk has been tested, and the water has been tested, and they cannot see where it comes from. Tomorrow there is a new case, and the next day another, and then another, until the town is full of it, and they cannot locate the source. Finally, one day some one says, "I wonder if it could be the dish-cloth?" And do you know, there are times when there may be danger in that little dish-cloth? It is only a little thing, and it is so easy, to put that dish cloth on and boil it out regularly; put it on in cold water and bring it to a boil, and the danger of that little dish-cloth will be overcome, and we can keep our people well and wholesome. There are sources from which typhoid may come into the home aside from the milk and the water. You know there a number of kickers against vaccination for small-pox. I suppose the people in this room are divided on the subject, but as for me, I will take the risk of vaccination rather than run the risk of taking small-pox. And so today they are successfully vaccinating against typhoid. In the United States army, where they have been vaccinating for typhoid, they now have three cases where they formerly had eighty thousand in a given time.

It was just a little tiny pain somewhere in the chest. The physician said "just a little touch of pleurisy; you will soon be all right." But the result was that the young woman, just ready for her life work, which included four years in a Medical College, during the summer in the hospital for experience got this little tiny pain, and lost several years out of her life's work and was barely able to pull through her examinations; and then comes the news that she has tuberculosis. Now she is still alive, but she walks up and down the sanitarium, and wanders up and down the State from one place to another, to find relief where there is none. Friends, if they said "pleurisy" to me—if they say "pleurisy" to you — do you know what it means? It means that in ninety-nine cases out of every hundred, it comes from tubercular inflammation? I did not mean to talk tuberculosis when I came up here, but it has been brought home to me the last two weeks. Every mail brings news to some one that some dear one is dead. Today, coming up on the train, I watched a young man—I don't know who—but I don't think he has very long to live, and his sister or his wife—I don't know which—who was with him. She went to the end of the train to take a drink, using the same cup from which she had just given him a drink. What can be the result? You should think that all that has been printed and taught on the subject would bring it home to them, but it does not. I feel very much as one whom you all know said "We know just a little better than we

do.” Sometimes we wonder whether the message finds readers. I have wondered about this, perhaps more than you have, and yet, sometimes where we least think, the message will go home. I attended a Farmers’ Institute, and one of the things we talked about was the home, how to take care of it, how to disinfect it, how to take care of the handkerchiefs, and that sort of thing. I went there again, afterwards, and one of the women came to me and said “I want to thank you for that talk you gave us before on how to take care of the handkerchiefs, and the care in the little things; I have followed it, and I have saved dollars.” So I believe it is a simple matter to go on and say just the same things over and over again.

It is just a little fly in mid-winter. About the middle of February there comes one of those nice, spring-like days, and the little fly comes out and you think no more of it. It lives until April 15th, and here you see the result:

April 15th,	1 fly
May 1st,	120
May 28th,	7,200
June 20th,	423,000
July 10th,	25,920,000
July 29th,	1,555,200,000
August 18th,	93,312,000,000
September 10th,	5,598,720,000,000

This table is taken from the report of the Pure Food Commissioner. I will not go into details, because you will not remember the figures. Had we not better have killed that little fly on April 15th? It is necessary not only for you and for me to kill this little fly, but it is necessary for every one in the community to do so if we want the community to be free from the danger of infection.

You and I believe that there is nothing in the world quite so important as life, and how we guard life, and how we take care of everything that will harm it. It is a serious thing when death comes into the house, and yet, do you know, within the last two weeks I have wondered if we value life as we should. Within the last two weeks I visited the Philadelphia Baby Show every time I went through the city. One of the things they showed was a light that flashed and went out, and every time that light flashes a baby dies—and I wonder—I wonder. There was a picture shown there; a fly came from a tuberculosis house across the way, through an un-screened window where a baby sat. He lit on the baby’s bottle, and contaminated his milk. This morning on coming here from Philadelphia, I could not resist the temptation, and went in again. I said to one of the men in attendance, “How often does this light flash?” He said, “Every ten seconds, and every time it flashes, a baby dies”—and then he added, as he figured it out—“not in Philadelphia alone, but in the whole United States.”

These little things! The flies are only little things, but they do a great deal of harm, and as we go through life, we will find that it is by looking after the little things that we accomplish the great ones, that win the “well done.”

WATER SUPPLY AND DRAINAGE IN THE FARM HOME

By MRS. JEAN KANE FOULKE

There can be no subject of more importance to the well being of a nation or state than the health and happiness of the individual men and women who make it. To have health and happiness, we must have good houses to live in, not necessarily *fine* houses, not expensive buildings, costly to build and costly to maintain, but we must have houses properly built to meet the climatic conditions of their environment and the occupations and needs of the people living in them.

As the business of running the house is usually regarded as "woman's work," the planning of the interior of the house at least, should be governed by what is best and easiest for her. Only such plans as will best facilitate her work, conserve her strength and surround her with most convenience and comfort, should be considered. A house to be a good house must be sufficiently well built to keep out the winter winds and weather and the extreme summer heat. It must have a dry, light cellar and a good tight roof with gutters and conductors to carry the rain water away from the foundations. It must have enough well fitted windows and doors to insure ventilation and fresh air and sunshine in every room and hall. It should also have some sort of heating apparatus other than stoves, a central system such as steam heat, vapor, hot water or even hot air, but when this last is used care must be taken that the air to be heated is drawn from the fresh air out doors and not from the cellar. Incidentally, I would say a certain heating system will be found cheapest and best in the end as one fire can be made to do the work of several and so save in the cost of fuel and labor.

When we have such a house we have what most people regard as a good house, but to my mind and from my experience as a house-keeper and mother and from what I know of other houses, "It is like the play of Hamlet with Hamlet left out," or like a human body strong and well made, but with a weak brain. No house can be a good home, I am not using the word home in its sentimental sense,—although I own it is less likely to be a home in that sense also, if it does not have a good pure water supply connected with it. And no home can be a good home that does not have a sanitary way of caring for the waste and the water that has been used by the household. I know I shall be met by the usual statement when I say this "That the average farmer cannot afford to have these things." I say in reply that it is not a question of the large expenditure that in most cases is the cause of having the conditions we do in our farm homes in regard to these matters.

It is due to lack of determination to have such comforts, such necessities in our houses. It is due to a lack of planning for improvements in our houses and to the acceptance of the old way as the only way. To the unfortunate idea, "that what is, is right," when in fact it may be all wrong. It is a rare exception in Pennsylvania,

when a man cannot have running water in his home by his own ingenuity or the use of his own brains and labor, if he chose to put the brains and labor into it. Water can be brought by gravity into many of our homes and wells and springs exist that are being used for generations, that at small cost could be connected with the house, the old oaken bucket and pump handle being anything but things of the past. The water from them could and should be pumped into tanks or reservoirs or better yet, air pressure tanks by rams and wind mills, gasoline engines or motors and thus forced into the homes of the farmer. Most of the digging and pipe laying, much even of the piping and actual plumbing and connections could be done by the man himself, if he only regards the result as worth while. It does not need to be done all at once, indeed my advice would be to "go slow," so as to be sure of getting what we want and the way we want it. But there is no reason why every house that has a pump, well or spring nearby should not have at least a kitchen sink with running water and a drain connected so as to give sanitary care to the kitchen waste at least.

This is the first step to what we farmers seem to regard as the privilege of the city man only—a home with modern sanitary conveniences, bathroom, closets, washstands, sinks, etc. Three-fourths inch pipe may be had for six cents a foot at wholesale or retail from seven and one-half to nine cents, the price varying slightly from time to time and according to quality used. When neighbors or granges and clubs buy together, the price could be much reduced by buying in large lots. First class gasoline engines with pump may be had for from \$50 and up while engines of a less high grade may be had for as low as \$20. A 500 gallon galvanized tank may be bought for \$70 and up to the large air tanks which cost from \$100 up. Therefore, I hope before long that no man will have the face to say, and that no woman will agree to it if he does, that they cannot afford to have running water in their home. The United States Government has lately issued a bulletin regarding this matter in which it states that the average farm woman lifts a ton of water daily as an item of her household tasks. Surely so much strength and vitality could be better spent. So much that stands for youth and energy, that might be used for better purposes, such as being better mothers and better wives and neighbors,—better women indeed, is worth conserving. It is this sort of work that makes house work "drudgery,"—that makes our girls want to leave the farm homes to become business women, and that strikes at and destroys the very root of human love and companionship between the husbands and wives,—we become toilers and forget to be lovers.

Because our duty to our neighbors is as our duty to ourselves and because the law has stepped in to see that we perform both these duties, the question of what to do with the sewage or waste from our houses, how to protect our own water supply and also our neighbors from pollution, has heretofore been a very difficult one. In fact until very recently, none has seemed to have any plan, that the Department of Health could accept that was within the reach of persons of moderate means. We were told of the endless dangers of pollution from well and pump drains, from cess pools and privies, from barn yards, pig pens, etc., but no feasible methods as to how to avoid these risks and do our duty were suggested, none indeed,

except those that entailed great expense and work and care that were prohibitive. At last, however, a theory has been worked out, so that it has become a practical possibility and today it is as possible for every home to have a sanitary drainage or sewage system as it is to have a water supply. Any man who is determined to have healthful surroundings about his home may do so. What is known as "the septic tank" has solved this problem.

I want to give you an idea of its workings and the simplicity of its construction. It is an easy matter for any intelligent man to build and construct himself such a sewage plant for his home at a minimum cost, a system that can grow with his household needs and that will very nearly take care of itself. The theory is so simple that it seems too good to be true and incredible that we have done without it all these years when we needed it so badly. However, the septic tank is not a new thing. Various forms of it have been experimented with for years with more or less success and at least we have one that has been tested and found successful after several years of use. I know of several in New York state and one especially that has been installed for over a year, taking care of the entire waste from two families, two bathrooms, three water closets and three sinks, and has been entirely satisfactory. It was built by a young farmer with the aid of two farm hands along with his own work. There has been no odor from it and no surface discharge. It cost, exclusive of labor, about \$50.

I think the most satisfactory way to explain this system is to show you some illustrations and explain its construction as I do so. I will be glad to answer any questions and explain anything connected with the illustrations that I can.

I am glad to tell you that this Department has reproduced a bulletin by Professor H. W. Riley, of Cornell University, at Ithaca, N. Y., on the subject of drainage for Rural Homes, which explains in detail the theory and workings of the septic tank system of drainage, giving working drawings so simple and plain that anyone can follow them, plans for the sanitary drainage systems for the small home, with only a kitchen sink and kitchen waste to care for, up to a complete sewage system for a large establishment with modern plumbing of every kind. This bulletin is the first of a series we hope to publish that will be helpful to the rural homes and people of the State.

Science has taught us that there are some bacterias that are friendly to mankind and it is on the habits and peculiarities of two of these that we must depend to make our septic tank sewage systems sanitary and successful. We must construct our tank so that the anaerobia bacteria may live quietly in the dark, undisturbed by any sudden jars or stirring or even by a swiftly moving current. To prevent this, we must have the tank built underground and with baffle boards which I will show you in the pictures. In such surroundings they at once begin their work of destruction and disintegration of all the solids that go into the tank which process is generally called "rotting,"—absolutely destroying them by forming them into gases or liquid form so that when the gradual filling of the tank ceases an overflow from the outlet, the effluent or overflow is ready for the aerobic bacteria to continue their work of purification. The aerobes do not destroy humus and this will settle in the bottom of

the tank and will only need removing about once in five years and may be done with the ordinary threshers pump. This refuse should be mixed with lime and chloride of lime and when dry may be used as a fertilizer. These aerobic bacteria, as their name suggests, must have air and sunlight to thrive. They live in the top soil not more than twelve or fifteen inches below the surface and seize on the disease and filth that may have escaped their cousins in the tank and gradually eat them up. The water eking away from the drainage tile below the surface is prevented from washing by storms into water courses so polluting them, before it is finally purified and clean. It is nearly clean before it leaves the tank and its flow through the tiles is so slow that the aerobic bacteriam bacteria have time to finally purify it before it spreads more than a few inches from the drains. By using the switch and slides I will show you drawings of a very small piece of ground may be used in this way for years, especially if a little lime is scattered on occasionally over the surface to keep it loose and to let in air and light. It is not recommended to place these tiles across a back garden but under a lawn or in fields that will be cropped to farm crops such as grain and grass. This is simply a precaution and may not be a necessity, but it is wisest to be on the safe side.

INCREASING FERTILITY

By R. P. KESTER

It is not my purpose to give my regular lecture on "Fertility Regained and Retained" to this body of institute lecturers and instructors, but rather touch upon a few points upon which we agree, or should agree, that are of primary importance to the practical farmer in the improving of the land he owns.

In the first place, I would like to say to every speaker and writer on agricultural subjects, to use every proper means and occasion to create and foster a popular interest in forestry. It is a lamentable fact that so few people seem to have the broader vision by which is shown the necessity of trying to make some amends to future generations for the reckless waste of forests that has been practiced in this country during the past two generations.

Few seem to realize the relationship that exists between a proper balance of forest land and cultivated land to insure reasonably permanent crop conditions that are favorable to success, to say nothing of the intrinsic value of trees to mankind in other ways. Public interest in this subject is at so low an ebb that it would be difficult to get a corporal's guard to attend a meeting on forestry in the average neighborhood. Men are trying vainly to work successfully steep and often stony hillsides when they would be better

planted to trees, and thus would erosion be prevented while moisture would be conserved for use in the more cultivatable land below. A great part of the land in this State is not suited to profitable cultivation.

Another subject that needs public agitation, is that of farming fewer acres and farming them better. The average farmer annually plows too many acres to give them sufficient tillage and attention with the labor at hand. Five acres in a crop well and intensively cultivated, insuring a full crop, is more satisfactory and profitable, than ten acres, but half worked and producing half a crop.

Another work of improvement that needs emphasis, is that of drainage. A great part of the farm land must be underdrained before full crops can be grown. The retention of water for too long a time is fatal to earliness, good mechanical condition, and best plant growth. Too many farmers thing of draining only when there are springs or spouty places, where as, any situation that retains water too long, becoming water-logged, must be drained before it can be profitable.

After disposing of surplus water the next great need in the average soil is humus. Greater emphasis needs to be placed and more definite information needs to be given as to how, when and where to grow cover-crops, as well as what plants to grow. Crimson clover, cow-peas, and soy beans for southern Pennsylvania; soy beans, rye and vetch for Central Pennsylvania, and rye and vetch for northern part of the State. In all localities a real, heavy grass-sod occasionally. A good grass sod can be produced only by top dressing, and holding it in grass at least two years. Added to all this is needed the systematic growing of clover in the rotation. No man can stay in business and buy all the nitrogen needed, and too many farmers are buying too large a proportion of the nitrogen necessary to grow their crops. Some legume crop *must* be grown regularly in the rotation. It is only the soil that is filled with humus and in good mechanical condition that gives best returns for the fertilizer applied.

I believe that we are warranted in recommending the use of more phosphoric acid and less potash. Official and individual experiments are so numerous and well distributed that, except in the case of sandy and gravelly soils, large applications of potash do not pay.

I am fully convinced that acid phosphate, i. e., the treated rock, is the best carrier of this material for the average farmer to use. Only those who keep a great deal of stock, producing large quantities of manure and using the untreated rock in stables and on manure pile seem to get satisfactory results from the use of "floats." There has been a great deal of agitation in favor of "floats." The past few years and so many have bought it and tried to use it as regular fertilizer, only to be disappointed, that I feel it the duty of Institute speakers to advise against it.

The maintenance of fertility on the average farm depends largely upon stable manure. Stock-raising should be intelligently encouraged in this State. The average farm is not maintaining as many head of stock as might be made profitable. Concrete stables and yards installed for the better care and conservation of manure is another need on most farms. No more profitable investment can be made.

These are some of the fundamental things in soil improvement. There are natural methods of building up soil that need more attention. We have spent too much time on artificial and superficial methods in the past. We need to talk less of percentages and pounds of foreign material and look closer to Nature's methods and adopt them. Thus will we not only enjoy life more and find more profit in agriculture, but be in the way of leaving the soil better than we found it.

LIME—ITS VALUE AND DIFFERENT FORMS

PROF. M. S. McDOWELL, *State College, Pa.*

This question of lime has been discussed so frequently and thoroughly that I shall endeavor to confine myself to one or two phases of the subject. Mr. Kester touched upon the importance of getting nitrogen in some other way than by buying it. Some exception was taken to his statement. Possibly what he had in mind may be stated in a little different way. All of you are more or less familiar with the general fertilizer experiment at the College. This experiment has been in progress for 33 years. There are five plots which have received no treatment during all of this time. There are four plots to which an application of phosphoric acid and potash has been made every other year. The rotation used has been a four-year rotation consisting of corn, oats, wheat, and timothy and clover. The fertilizer has been applied to the corn and to the wheat. The following table shows the yield of these four crops from the nothing plots and from the phosphoric acid and potash for a five-year period during the later years of the experiment.

	No. treatment. five plots	Phosphoric acid 48. Potash 100, four plots
Corn, ears, bushels,	36.6	51.4
Oats, grain, bushels,	23.4	34.4
Wheat, grain, bushels,	10.5	19.9
Hay, pounds,	2329	4469

The object in calling attention to these figures is not so much to show the value of phosphoric acid and potash as it is to emphasize the importance of nitrogen. The fertility of the plots which have received phosphoric acid and potash has been maintained through-

out the 33-year period. This has been done without the application of any nitrogen, either in the form of yard manure or fertilizer. The nitrogen has been maintained by means of the clover which appeared in the rotation. Nitrogen is essential. There are three ways in which it may be obtained: by growing clover or some other legume, by using yard manure, by buying it in commercial form. These three ways are all right in their place, but is it not good business to get as much nitrogen as possible by means of clover and through the yard manure? Buying in commercial forms may be necessary to supplement that obtained from these other sources. It is a case of getting what you can without paying for it. In many instances it has become difficult to get a stand of clover. There are thousands of acres in Pennsylvania which are not as productive as they should be because of deficiency in lime. Clover and the leguminous crops require lime. At the Cornell Station some years ago an experiment with lime and fertilizer was conducted. A poor farm in the neighborhood was obtained. The farm was divided into two parts, one of them which was limed and the other unlimed. Different fertilizer treatments were then given to portions of both the limed and unlimed series. The results were as follows:

No. plats			Unlimed	Limed
5	Nothing,		1824	3852
1	P, K,		2319	4174
1	P, K, N,		2235	4085
1	15 tons manure,		2091	4976

P—Acid phosphate, 100 pounds.
K—Muriate of potash, 50 pounds.
N—Nitrate of soda, 100 pounds

In every instance better results were obtained where the lime had been applied. Not only was there an increase in quantity but the character of the grass itself was changed. While on the unlimed plats the clover was replaced largely by red top and sorrel, on the limed plats there was a considerable portion of blue grass. Any land, which, when seeded to clover tends to produce red top and sorrell, should be limed.

Limestone, or carbonate of lime, is practically the only material which can be used to sweeten the soil. When carbonate of lime is burned a portion of it goes off into the air as gas and we have burned lime or quick lime remaining. One hundred pounds of pure limestone, if thoroughly burned, would produce 56 pounds of burned lime. When water is applied to this burned lime it slakes. If water is not applied to it, moisture is gradually absorbed from the air and the same change takes place. If the 56 pounds of burned lime were given just sufficient water to slake it, 6 pounds of hydrated lime would result.

DIRECTOR MARTIN: Will you permit a question relative to the hydrated lime? What effect, if any, would time have on hydrated lime if it were kept?

PROF. McDOWELL: I was just about to speak of that. When stone lime or water-slaked lime has been exposed to the air, it finally takes from the air carbon dioxide, the material that was driven off by burning the limestone. The 56 pounds of burned lime would increase in weight until it became practically 100 pounds. In general, one ton of burned lime would require two tons of ground limestone, or one and one-third tons of hydrated lime to furnish the equivalent amount of lime.

A Member: If you apply burned lime and carbonate of lime, will they act the same?

PROF. McDOWELL: If the limestone was finely ground it would act as quickly as the burned lime. An experiment has been in progress at the Experiment Station for two years for the purpose of determining the relative value of burned lime and limestone, as well as the value of limestone in different degrees of fineness. The value of lime is based on these factors; solubility in water, efficiency in correcting acidity, nitrification, and growth of plants. The following figures show the solubility in carbonated water as compared with distilled water:

	Rain water Parts per Million	Carbonated water Parts per Million
Burned lime,	2258	2201
Ground limestone (100 mesh),	14.1	121
Ground limestone (20 mesh),	7.1	66
Ground limestone (8 mesh),	5.3	40

Limestone is practically insoluble in pure water, but when applied to the soil it is readily dissolved by the soil water. It will be observed, too, that the finer the limestone the more soluble it is.

The first function of lime, after being dissolved in the soil, is to correct the acidity thus making the soil sweet. A very acid soil was treated with different forms of lime and after one month the acidity was determined. The following figures show the relative value in correcting acidity. These figures are stated in percentage of total acidity corrected.

Burned lime,	90.3
Ground limestone (100 mesh),	80.6
Ground limestone (60 mesh),	61.9
Ground limestone (20 mesh),	33.2
Ground limestone (8 mesh),	22.2

These figures indicate that the finely ground limestone has practically the same value as the burned lime, the difference being about 10 per cent. In case of the 60 mesh there is a difference of over 30

per cent. in the amount of acidity corrected and this becomes more marked as the limestone becomes coarser.

When the soil becomes sweet nitrates are formed. This change of nitrogen into a form in which the plants can use it, is called nitrification. The following figures show the extent to which nitrates were formed. These figures are stated in parts per million of nitrogen:

Burned lime,	143
Ground limestone (100 mesh),	82.9
Ground limestone (60 mesh),	80.3
Ground limestone (20 mesh),	37.
Ground limestone (8 mesh),	6.3

It may also be of interest to observe the results as gauged by the growth of plants. Clover and oats were grown and the following figures are based upon the percentage of increase over plats which were not treated:

	Clover	Oats
Burned lime,	90.5	19.8
Ground limestone (100 mesh),	87.6	19.
Ground limestone (60 mesh),	22.5	18.5
Ground limestone (20 mesh),	5.	13.1
Ground limestone (8 mesh),	2.7	12.6

These experiments have not been in progress long enough to draw definite and comprehensive conclusions. They do, however, seem to show the trend. If limestone is used it should be finely ground, probably not larger than 60 mesh. The finely ground limestone will give approximately as good results as burned lime although it is necessary to use practically twice as much per acre.

Lime improves the physical condition of heavy soils and it is some times true that burned lime will therefore have a better affect than limestone.

HUMUS IN THE SOIL

By ROBERT S. SEEDS, *Birmingham, Pa.*

Mr. Chairman, Ladies and Gentlemen: I want to say that I was down at Bloomburg last week and talked on soil, and they kept me on the platform all afternoon, and at the close of it, Brother Martin said: "Come up to our round-up and give us the same talk." I have been talking soil for eighteen years, and am still on the subject. Every man on the platform this morning has been a student of mine.

PROF. MENGES: I'm glad I'm not going to talk this morning.

MR. SEEDS: So am I. After what the men preceding me have said; you can see how much is left for me to say.

But to talk about the soil now, I don't know where to begin and where to end. I have no manuscript and no notes; but yesterday afternoon when I heard the gentleman from State College talk about stock raising, and the blooded sire, and the different kinds of stock, and what they could do with it, I said to myself: "You can figure along that same line in anything you do." When you want pure-bred stock, you do not use a mongrel sire; and when you see a field that is full of humus, there you have your pure-bred soil. I want to tell you there are lots of things that you cannot do in stock raising, and there are lots of things we cannot do with the soil. There is no man on the face of God's green earth that can take a razor-back and make a hundred pounds of pork as cheaply as with a thoroughbred. Down South, when they want to know whether a razor-back is fit to kill, they lift him up by the ears, and if the body is heavier than the head, he is ready to kill.

In soil-making, as in everything else, each one has got to figure out his own problem:

"If all our joys and sorrows,
Upon the line were hung,
And each would take the other's,
We would all cry 'stung.'"

Now, what we want to do is to get away from the mongrel form of soil, and get into the blooded class. Now, I remember when my grandfather hauled out the old manure and grew the biggest crop between here and Nova Scotia. Why? Because he was working the humus out of the soil; so was everybody else; and when the soil was exhausted, then they moved on West and opened up the West. They had worked the food matter out of the soil, and it was depleted and would not produce any longer. So long as you have humus, you can control the moisture, and you can control the heat, and you can produce crops. I took that old farm when no one else would have it, and I have no boy or girl that would want to leave it today. Why? Because I have put back the humus into the soil, and made the old farm a fit place to live, and whenever I look at that old place, and then hear some one say that farming does not pay, I want to be shown; I'm from Missouri.

Now, when I walk over a farm and see places where alfalfa grows about four times as thick as clover or timothy, I say to myself, "Why not put the whole farm in alfalfa?" And I have been going over the country from one end to the other, telling them how God made the soil. I started out to get up a lecture on "How to make money in a purely scientific way"; but finally concluded that the best way to teach the farmer to make money was to show him how to build up his soil. The whole thing is to get a ten-dollar bill, and to get it as cheaply as possible. I have four boys and two girls, and I have always needed money. You cannot do much with fresh air and pure water. I went back thirty years and I was the first man to advocate spreading barnyard manure on the top. They fought me up and down the country, and they fought me through the "National

Stockman and Farmer," but I fought it out, and I want to tell you that the way to put productivity back on that farm is to put humus there. You may talk all you want about the air being four-fifths nitrogen, and your potash and your phosphorus; I know that when I have the humus in the soil I can hold the moisture when Brother Bond has the heat; and I know that when I have these I can raise clover and get a better nitrogen than you can buy, and something that will produce a better humus, and retain the moisture. I found the other day, on the front page of the Presbyterian Banner, a picture of an ancient dam; through the archway you can see the ruins of an ancient city. I started to tear it up, when my attention was attracted by the picture; over the top of the archway the stones had crumbled, and vegetation had begun to grow. That soil that had been blown there had humus in it, and vegetation began to sprout. The best way is to go back and let Nature help you. My boy has put down a field in corn this spring that had been in alfalfa for fifteen years; we had cut alfalfa from it three times every summer; that field has never been manured; it has never had any commercial fertilizer, and yet it is a better field for corn today than it was fifteen years ago. Why? Because that soil has humus in it.

Prof. Hopkins and some of those Illinois people have been telling folks that land in Illinois is worth \$400 an acre. That may be, but I would rather have a four hundred dollar man on twenty dollar land, than a twenty dollar man on four hundred dollar land. Given the man, he will make the land—or he will ruin it by taking off of it more than he puts back.

I want this plant food because I want to make that home better and better, so that we may keep our boys and girls on the farm. We heard about it yesterday. There is no use in going over it again. But I want to tell you, my dear hearers, that boys and girls have poodle dogs beaten a mile, so far as I am concerned. That is why I want an acre to produce more, and I can do more than I could a year ago, because I have Nature on my side.

HOW NATURE MAKES SOIL

By J. T. CAMPBELL, *Hartstown, Pa.*

Mr. Chairman, Ladies and Gentlemen: I think most of you will rejoice that I am not going to make my speech at this time. It was not prepared for this Institute, and it consists chiefly of lantern slides. Since it is so close and warm, and it will be necessary to close up the room and darken it to deliver this talk, I will not inflict it upon you at this time. I will simply talk to you for a few minutes on some experimental impressions that have come to me in my work.

What I know is based chiefly on practical experience, and much of it was learned through mistakes; but our scientific men sometimes make mistakes as well as other men—and I say this with all due respect to scientific men—so perhaps you will not think the less of me for this, even though I am not a scientific man.

The subject of "How Nature Makes Soil" goes away back to the beginning of time, when the world came into being as a mere molten mass, down to the present time, and all this time Nature has been making soil, on this old planet of ours. We get the idea that the making of soil is a thing of the past—of past epochs; I am fully convinced in my own mind that soil-making is going on as rapidly today as it was in any of the great geological epochs of the past, and it is of great importance that we assist Nature in her work, and that is where a whole lot of our agricultural work, and a whole lot of our farming, has failed, because it is not in harmony with Nature's method, and so long as it is not in harmony with Nature's method, it will accomplish nothing.

How much of this land has been farmed for five hundred years? Out in the western part of the State, it has not been farmed for two hundred years. Up in Crawford county we have land that has been farmed for thirty years, and is not producing what it should; it produces plantain and other weeds. Why? Because the farmers have not been in harmony with Nature, and with Nature's God. When I took up the question of farming some years ago, and put everything I had on earth in that land, I soon found that the land did not produce what I had counted on, and what I had to have to pay for it. I interviewed my neighbors and they informed me that my land produced as much as any other land there. So I concluded that if I wanted to keep out of the hands of the sheriff I must do something different from what my neighbors were doing, and if you want to know how I succeeded, I invite you, all of you, or any of you, to come to my home at any time and inspect my books; they are always open to inspection.

Now, then, in order to help Nature make soil, there are three things we must do. What are these three things? The first is drain the land. Up there in Crawford county, on the Volutia soils, we need to drain. Out in Western Pennsylvania there is good land to be had for \$50 an acre; in Northern Illinois they are demanding from \$350 to \$400 an acre for the same type of soil. Why? Because they have made farming a business proposition out there, and have gone to work to help Nature make the soil. They have drained it, and done their part in other ways. If I were to take that land in Western Pennsylvania at \$50 and spend \$25 in draining it, and another \$25 in otherwise improving it, it can be made to produce more per acre than the \$350 an acre land in Northern Illinois. As our friend Seeds says, it depends upon the man.

After you drain your land, the next thing is to give it a supply of lime to sweeten it. The reason we have been successful with our land is we drained it, and we limed it. Many a man today is spending money buying commercial fertilizer, and not getting results. Why? Because his land is in no condition to get the plant food.

The whole thing hinges upon the economy of the thing. A man can grow wonderful crops, and if he is not economical, he will fail with it. The first problem that was brought to my attention was

not only to get results, but to get results at a profit. The whole thing hinges on the organic matter in the soil. In our clay soils, and in our Volusia soils, there are wonderful amounts of inert matter that the soil cannot make use of. Right here comes in the advantage of growing more plant food, and getting Nature to use the supply on hand—putting the soil to work on it. Terry, in Ohio, advocated this, but he was twenty years ahead of his time. He never saw the results. Why? Because the soil could not make use of it. At the Ohio Experiment Station they find the same thing, and at Urbana we find the same thing. I don't know whether you like that or not; but it is a fact that until we used lime, we could not get the soil to use the organic matter that was in it. I might say that since we used lime, we have had the results. If you don't believe it, my books are open for inspection.

The problem of the farmer is to get the organic matter. One method is to seed with rye. I cannot go into details but simply throw out these few remarks as pointers along the line. The hour for adjournment is at hand, so I will stop right here. I thank you.

PRODUCTION AND MARKETING OF DAIRY PRODUCTS

By L. W. LIGHTY

Why dairy? It is an easy way to keep the soil fertile. It is the logical way to market many of the farm products that would otherwise be unprofitable. It is a delightful way to make money on the farm. Dairy products are the best and cheapest food for humanity. Milk is the only natural complete food except eggs. It is an article of food that will be used more and more as humanity becomes educated along diatetic lines. The babies must have milk. The invalids must have milk, and the rest of the folks will have milk while the girls demand more and more ice cream. Butter is the most easily digested of any wholesome food in our dietary. Cheese is the poor man's meat and he is rich as compared with the fellow who consumes a 75c tenderloin with the "tender" departed 12 years ago or lamb chop with many interrogation points after lamb also six years added to its life.

Ice cream is a good part of Cupid's ammunition and goes fine with the bunny hug and tango, indeed it always goes. The statistical authority says two gallons of ice cream for every man, woman and child in this country annually, but observation indicates that the girls get most of it. Seriously, no people ever flourished and grew powerful without the dairy cow as part of their national equipment. As patriotic citizens of this the greatest nation on earth, it behooves us to seriously study and industriously develop the dairy industry.

Who should do dairying?: Or we might ask who should stay out of the dairy business? If your farm, your land or your market is not adapted to dairying or if you have a local market for some article that gives you more profit better not devote the land to dairying. If you hate the cow and the business, if you say, "I do not want to be tied to the cow," or if you had rather be "tied" to a cur dog, or the corner grocery, or the old pipe and the grog shop, why that is none of my business, but stay out of the dairy business because it will be a miserable failure. If on the other hand it is your delight to work with the dairy cows, study their ways and wants and supply them intelligently you are the man for the dairy. If the cows have your first attention in the morning and the last in the evening, if for the betterment of that herd you can forego the yarn swapping grocery, or the nickelodian and rise with the robin in the morn, be as industrious as the ant and happy as the lark all day long you are cut out for a successful dairyman. Get into the game, there is a fortune awaiting you.

What do you need to start dairying? The idea seems to have gone forth of late years that the main thing the dairyman needs is barns, stables and equipment galore. The sanitary stable with all its ventilating contraptions, the wood-lined iron nickle plated swinging stanchion, the water outfit, the overhead carrier, switches, cars, rolling stock, etc., until bushels of dollars have been invested. Then we must study scientifically balanced rations from books, bulletins and tables until our head aches. All these are matters of importance but not of the first importance by any means. Very often I am appealed to to help plan an equipment and devise a balanced ration and when I inquire about the cows I learn that they are quite a secondary matter. They are good, bad and indifferent but mostly indifferent. The owner fondly hopes that if the equipment is up to date and the ration scientifically balanced the cows must make a profit or bust. This of course seems ridiculous but it is true very often. Many a man spends so much money on equipment that he feels unable to make the required investment to secure the best dairy stock. This is a serious mistake. It is hitching the cart before the horse.

We must have good dairy cows: Statistical authorities, who are good guessers, I presume tell us a third of the cows we keep for dairy purposes are unprofitable; but the cow testing association work proves that about the half of the cows we have can not pay for their keep. This is a serious condition and it is not a theory, depend on it. Not more than one farmer in fifty knows what his cows are doing in the way of production. A farmer keeps 20 cows, ten make him a profit while the other ten make him nothing and loose him money. This seems like a most ridiculous piece of business, but the great majority of folks are pursuing this course in all seriousness and without the least attempt to improve conditions. They tell me they can tell a good cow by looking at her. Men who are otherwise sane actually tell me this. When a superstition becomes deep rooted it cannot be thrown off but must be outgrown. This is surely true of our foolish notion that we can tell a profitable cow from an unprofitable cow by looking at her. A campaign of genuine and funda-

mental education is of the utmost importance. I rode on the splendidly equipped milk train on the Lehigh Valley Railroad the other day. On it were drawn to New York City nearly a quarter of a million quarts of milk. The transportation company makes a profit drawing that milk. Every handler and distributor of that milk makes some profit, and the consumer gets it at a price that makes it the cheapest food he can buy, while the man who produced the milk by hard and continuous labor actually lost money on a third to a half of that quarter million quarts speeding in that milk train towards New York City. No wonder those farmers scold and use harsh language and groan under the burden they are laboring, though they do not realize that the remedy is in their own hands.

I am thoroughly convinced that no line of work before the extension workers, State and national, and the agricultural press, relative to dairy improvement is of as much importance as that of enabling the farmers to eliminate the unprofitable cow and put the herd on a business basis. Without this the farmer goes floundering along improving this, remodeling that but he neglects the foundation of his business and the entire structure is in constant danger of collapse.

The individual cow is the foundation unit of the dairy business: The cow that will not pay for her keep cannot make us any profit. This is so self-evident that a six-year-old will grasp it and yet strange to say only one in fifty of us big folks do actually grasp it. I know this is true because the other 49 continue to feed and keep the cows that do not pay for their keep. How do I know this? Because when we applied the test in Pennsylvania or any other state it was proven true. Not one test told any other story. My daily observations shows it to be true. The endless growls of the dairy farmers indicate its truth. Here are some cold unpleasant facts. Let us take our bitter medicine and be done with. Two and a half years ago the farmers in New Hampshire organized a cow testing association comprising 26 herds, or 326 cows. The conditions for an economic production from these herds were a great deal better than the average because the cows were above the average. Before the first year was up 103 cows were sold. These were so impossible that no further account is given of them. A few died or dropped out and 203 cows completed the year's record. Of these 129 cows made a profit of from \$4.95 to \$58.12 each. The other 74 cows lost their owners from \$4.14 to \$42.95 each. Starting with 326 superior cows 120 of them proved profitable when a real business test was applied. Who is to blame if dairying is unprofitable? You answer that question please.

There are two simple questions every business dairyman must answer or he is no business dairyman. What does it cost to keep the cow? How much income does the cow bring during the same twelve months? A Chester county farmer told me it cost him only \$18 to find out that he was losing \$195 a year. Cheap education, isn't it?

What does it cost to keep a cow a year?: Those 26 New Hampshire farmers found when keeping a record it cost them as follows:

Cost of feed,	\$73 03	
Labor,	32 33	
Delivery milk,	7 18	
Housing cows,	9 05	
Depreciation on cow,	8 83	
Bedding,	4 00	
Rull,	3 79	
Taxes and interest,	1 55	
Ice, coal and wood,	2 17	
Veterinary service and medicine,	87	
Tools, utensils, salt, etc.,	53	
Cow testing association expenses per cow per year,	1 40	
Credit,		\$147 73
Manure,	\$15 00	
Calf,	3 00	
		18 00
Net cost,		\$129 73

I said hardly half the cows kept by the farmers for dairy purposes do pay for their keep. The above test of superior cows shows hardly 40 per cent. of the cows paid for their keep or made a profit. How can we dairymen solve this all important business problem on our farm? Prof. Stevens will tell you later in the session.

The careful experiments made at the Maryland and Pennsylvania experiment stations and some private experience points to a simplified sheltering of our cows. The open air cow stable may in a great measure solve the problem of that terrible scourge of the dairyman and breeder, viz: tuberculosis. Vigor and vitality induced by plenty of pure bracing air may also help us to ward off some of the other diseases that so often bring great loss to the dairyman. The simplified method of mixing and feeding a balanced ration, as outlined by Dr. Armsby and Prof. Van Norman of State College, enables us to feed a balanced ration almost as easily as any other. If the open air stable works out as favorably as all available data indicates we can greatly reduce overhead expenses which kept increasing rapidly as the years went by and the stable equipment manufacturers increased and multiplied.

The business dairyman has had two distinctive business propositions in view: First, to reduce the cost of production; and, second, to increase the selling price to a just and honest basis. Keeping a record and weeding out all unprofitable cows, reducing the labor and equipment cost, feeding a more efficient ration will help to solve the first proposition. The second is more difficult and I am not sure that we know just how to solve it. Every manufacturer in whatever line he may work invariably makes the price for the product he produces or quit business, except the manufacture of dairy products. Here the middleman or handler makes the price to the manufacturer as well as to the consumer. The dairyman is patient and long suffering beyond all the rest of humanity, but patience in this matter has long ceased to be a virtue.

The time is here when the producer of dairy products must look after the final marketing of his products. Every other manufacturer does this because it is one of the essential elements of successful business. The fact is the farmers generally have not given the marketing of their dairy products a minute's thought. I lately visited a section with a number of small towns. The farmers shipped all

the milk to a large city nearly a hundred miles away and the merchants had all their ice cream and much of the butter sold shipped from the same city. I have a letter from a well-known man who had to buy \$5,000 worth of milk last year right here in Monroe county, Pennsylvania, and every dollar of that money was sent up to New York for milk. I wonder how many Monroe county farmers are sending milk to New York?

Organization, must be the watchword of the dairymen in the future. Organization, intelligently applied will solve nine-tenths of the dairymen's troubles. It will eliminate the unprofitable cow. It will bring good pure bred sires into every community. It will improve the quality of the product. It will search out the unsupplied market and reach the consumer through the shortest possible route. It will regulate conditions so the market will always be supplied but never over-supplied. It will educate the consuming public to the facts that milk and milk products are among the best foods in our dietary; also very much cheaper and more economical than any other comparable food. The cow testing association is the unit organization, it is absolutely essential first, last and all the time to successfully produce and profitably sell dairy products.

HOW MUCH MILK PER ACRE AND WHAT GRAINS FOR THE DAIRY COW

By PROF. H. P. DAVIS, *State College, Pa.*

I was very much interested in the card that has just been gotten up by the East Stroudsburg bank. It simply shows the interest that is being taken along the line of helping the farmers by the businessmen of the community.

There are various systems by which we can keep up the fertility of our soils; but I believe that the easiest one is by keeping livestock and returning the manure to the land. I take it that the farmer is in business for profit as well as pleasure, and I don't think we want to take all the profit out of the farm this year, or in five years, and then let it go. That is a short-sighted policy, and one that is going to break this country up, quicker than anything else, unless we do something to check it. Now so far as livestock is concerned, I have no argument at all with the man who wants to keep beef cattle. They have their place, but I want to take up the question of the dairy cow particularly.

Now, the dairy cow has claims on all of us, and I think that she can be made a profitable investment both for her milk, and for what she returns to the soil. Look at Denmark and Holland, and some of the other countries of Europe where dairying has been carried on for decades, even centuries and see the fertility of their soil, and the general prosperity of the country. We have heard a great deal

for several years about the fact that it does not pay to farm. Why is it? Is it the fault of the farm, or of the man who does the farming? I think the trouble is not with the farm, but with the man. We will have to get over the idea that any one can go out and farm. It requires not only industry and hard work, but it requires brains. It requires a great deal of planning and business ability to carry on the business of farming.

The first thing a man has to have to start the dairy business, is cows. You say you can buy cows, lots of them, for forty or fifty dollars. That is all right to start your herd, but there are localities where men have made money by buying fresh cows, milking them for a certain period, and then selling them, but I believe in the long run this system will be unprofitable. Then comes the question of breed. First of all, select a breed that is adapted to the market which you supply. For a milk market, the Holstein or Ayrshire, for the butter or cream market, the Jersey or Guernsey. If a breed is established in the locality, think seriously before adapting any other. The average man starts in without any definite idea of this, simply thinking he must get enough cows to start in the dairy business. The result is, as Mr. Martin has just told you, one-third of the cows in Pennsylvania are kept at a loss. In any mercantile business, would you run for five years at a loss? No; you would begin to take stock, and see where your loss was; so it is with dairying, you must take stock, and get rid of the unprofitable cows.

Our dairy cows have not increased in proportion to the population. Last year something like eleven million dollars were spent in this State for dairy products, and yet the dairy cow has just about held her own. When meat goes so high that the poorer class never use it—I hope that time will never come—there will still be a market for milk, because there is no better or cheaper way to secure the nutrient protein than through milk and cheese. Therefore there is bound to be an increased demand for milk and its products.

Now in any system of dairying, we must first establish a standard and then try to live up to it. First, we must have a good dairy cow. How are we going to get it? It is very simple; so simple that even a child can do it. That is to keep an accurate record of what each cow produces. You can get one of these little balance scales and hang the bucket on it; it will take about ten minutes if you milk twenty cows. It certainly is worth that small amount of time to discover whether your cows are boarding or not. You say, "I have a dandy good cow; she gives a bucket and a half full of milk every day." Yes, but how long does she continue to do this? For six months, and then stops? Each cow should be charged a certain amount for her feed, and that deducted before she is called a profitable cow. Thus we can determine the profit of each cow in the herd.

Next comes the question of handling the cow. At the Cornell Experiment Station they have taken cows, and by careful handling of them, have increased their butterfat yield from ten to twenty pounds per year, making cows that did not pay for their feed come into the class where they just about paid for themselves, and increasing those that just about paid for themselves into cows that paid a profit. This is just an example of what good management is able to do and I believe that these results can be secured by most farmers.

The first thing in the care of the cow, is careful feeding. If she produces twenty pounds of milk it will cost you approximately ten cents to keep that cow alive, and ten cents to produce the twenty pounds of milk. If forty pounds is her production it will cost you twenty cents plus ten cents to keep her alive, or thirty cents in all. This is just to give you an idea of how the cost of production can be cut down. You must produce your crops just as cheaply as possible, and produce just as large ones as possible, and the cheaper you can produce your feed, the cheaper you can produce milk. At the present time the producer has little or nothing to say as to how much he shall receive for his milk. He sells to the milk dealer or creameryman and takes what they are willing to give him. If that does not suit him, he makes butter or something else. The one thing to do is to cut down the cost of production, and then make more money on that end of our dairy.

One point I intend to talk of, is the point of breeding. We should have more of the spirit of co-operation. If we could get more of that spirit of working together everyone would benefit. For example, one man has a Guernsey, another a Brown Swiss, or Ayrshire or something else. Now that may be all right, but when you have a surplus, what is the result? You sell to the butcher, because no one will come in and take the one animal that you have to offer. Your neighbor is in the same position, but if you have one breed in a neighborhood, you can find a buyer for all your surplus stock, and have it shipped out in carlots. In this way much better prices can be secured for all stock. Take Centre county, for instance, up there in one neighborhood every one had Guernsey, and a buyer came in from Ohio and brought up all their surplus stock, amounting, I think, to three carloads, at prices far better than the farmer could have gotten locally. It certainly paid these men to have the same breed. Up in Bradford county very nearly the same thing occurred with Holsteins. In every county the farmers that breed dairy cattle should pool their interests, as they do out in Waukesha county, Wisconsin, where they breed Guernseys very extensively. Two years ago their sales amounted to something over a hundred thousand dollars on surplus stock only. Their main business is supplying milk for the city of Chicago. They tell men that in this county there has been a start made in Ayrshires. I have not seen them myself, but I think this is a county that would be very well adapted to Ayrshires, and as I understand it, the market is mainly for milk. In the milk business, Holsteins or Ayrshires will do very well unless you get an extra price for your milk. If you keep your cows for butter, then get Jerseys or Guernseys.

The next question is, How much milk you can produce per acre: You can make any construction if you want, and you will find the subject open to criticism. I will quote a few figures from the 1910 Census of the U. S. Department of Agriculture. The average Pennsylvania farm of eighty acres furnishes a good basis, if divided into four fields of twenty acres each, and planted in corn, oats, wheat and grass, would yield an average production of, wheat, $14\frac{1}{2}$ bushels, oats, $29\frac{1}{2}$ bushels; corn, 34 bushels; hay, 2,400 pounds. This is a very common rotation practiced in Pennsylvania at the present time. Now, how many cows could we keep on this eighty acre farm? If every bit of the crops produced were fed to the average cow of Penn-

sylvania who produces 4,000 pounds of milk and 160 pounds of butterfat a year, some twenty-three cows could be kept with an excess of energy. Should a ton and a half of protein be fed purchased in some bought mill feed, seven more cows could be kept. Now this system would not be profitable, for cheaper feed than wheat can be purchased. It merely shows the possibilities under the average conditions. By increasing the crop yields it will be found that the cost of producing milk can be lowered considerably. We must watch the corners so that the cows will be keeping us rather than our keeping them.

It is a very important matter to most of us to determine the cheapest feeds that we can supply the proper nutrients to our cows. Nearly always the roughage is raised on the farm. This may be hay, silage, straw, or corn fodder. Part of the concentrates are also raised such as corn and oats. Now the problem is to secure certain concentrates that will balance the home-grown feeds.

There are several requisites that a mixture of grains should have. First. It should be economical. Protein and energy should be secured at a low price. The importance of this is self-evident. Care must be taken to see that the price per hundred pounds of the feed itself is not deceptive. The only true price is that at which one-hundred pounds of the protein or the energy can be purchased. Second. A grain mixture should have bulk. In a loose, flaky mixture, the digestive juices can permeate the feed easier and a greater degree of digestion is accomplished. Third. Palatability is essential. A cow may eat to some extent that which is not appetizing, but she never will consume the large amount offered that she would otherwise. Feed is the raw material from which the milk is made, and roughly speaking, the more feed, the more milk, up to the limit of production of the cow. Fourth. Variety is quite necessary also in the grain mixture. By the use of several grains, a mixture can be made up that the cow will eat for a long time without tiring of it. Fifth. Lastly, the effect of the feeds upon the system of the cow. A balance must be struck so that there will not be too much laxativeness or the opposite. A grain mixture is made up to completely balance a ration when fed with one or more roughages. Roughages may be divided into three classes, depending upon their protein content. In the first group, timothy and silage, corn stover, straw, etc. Mixed hay or any case where half the roughage is clover, alfalfa or other legume hay compose the second group. The third group of roughages is composed of all leguminous hays.

Roughage should be fed to the cows, all that they will eat up clean. Then feed the grain mixture in the proportion of one pound of grain for each three pints or pounds of milk. Corn meal furnishes the basis of the mixture. It is a home-grown feed, and ordinarily supplies energy the cheapest. Cottonseed meal, gluten feed, oil meal, are three feeds that furnish protein cheaply, so that at least one is usually used. A grain mixture, to possess the qualities desired, should be composed of four grains. Corn, cottonseed, gluten and dried distillers' grains are four concentrates that can be mixed to balance along with any roughage. At the College we feed mixed hay and silage for roughage. With these we use a mixture composed of 275 pounds of cornmeal, 150 pounds of cottonseed, 200 pounds distil-

lers' grains and 100 pounds of gluten feed. This mixture fed in the proportion mentioned above gives us excellent results. Bulletin 114 of the Pennsylvania Station takes up this short method and every farmer should have it.

The question of out-door treatment came up yesterday, but I am not fully prepared to state results. The last three winters we have carried on an experiment with dairy cows, the same as Prof. Tomhave describes with beef cattle. We do not feel that we have carried it far enough to give the results as final; we expect to carry it on for two years more, at least, and perhaps more. We find that these cows kept out of doors consume more feed, particularly more roughage, have better appetites, consume more water (and we don't warm the water) than the cows kept indoors. We find the outside treatment requires a little more bedding. We find that the milk yield of the cows kept outside does not keep up quite so well as that of the cows kept inside. The decrease in milk yield for the winter amounts to a little over a pound of milk for each cow of the outside group more than the inside group. At the Maryland Experiment Station they are conducting a similar experiment and they are heartily in favor of it. In Maryland they are working it out on the tuberculosis question, and there is no doubt that the outdoor cows are very much benefited by their treatment.

ADDRESS OF MR. BURNETT

Ladies and Gentlemen: I am glad to be here, and as a representative of the Lehigh Valley Railroad, I am glad to have an opportunity to speak to you. We are doing quite a good work along the line of the Lehigh Valley Railroad; it is not a philanthropic work, but one entirely selfish. We are endeavoring to get the farmer to produce more stuff to ship over our line. All this year I have been endeavoring to establish storage houses along our line where the farmer can bring his apples and potatoes, etc., and have a man in charge who can market them better than the farmer himself can. I believe this would put an end to the high cost of living. I think that this high cost is justifiable to a certain extent. There has been a bill up in the New York Legislature to establish a large market house in New York City to which the farmer can bring his produce; it would have to be done on a tremendous scale, and I do not see how it would benefit the farmer except that it would leave no question as to the payment, but I think if we could establish these store houses along the line, it would be a success. We have been working along that line in New York for the past year, and working with some success. I think the Grange and some of the other organizations should take up this question. The first thing is to raise more stuff; the second is to market it. The State College and Experiment Station and the Farmers' Institutes are doing all they can to help the first, and the other end of it, I think should also be taken up.

ADDRESS OF MR. JONES OF THE STATE HIGHWAY DEPARTMENT

Ladies and Gentlemen: There are several things in Pennsylvania today that make it necessary for anyone from the State Highway Department to have a great deal of courage when he goes about the State, but I feel that I am in an audience of my friends, and I am going to tell you plainly all about the deplorable condition of our highways, and the condition of affairs in the State Highway Department at the present time. I am not going to make any attempt at a speech, as you will notice later on.

At the present time, the State Highway Department is laboring under a lack of funds. There is at present \$1,300,000 paid into the State for the receipt of auto licenses. The recent Legislature appropriated this auto license money for the use of the State Highway Department, with the proviso that these moneys should be made available at once, so as to avoid the necessity of issuing bonds. But the Auditor-General and the State Treasurer, on some technicality, refused to turn this money over to the Highway Department and have carried the case into the Dauphin County Court, where it is at the present time. And here is a statement that I want to make as soon as I can possibly make it.

The Dauphin County Court is composed of men of very high standing and character, and if this court should decide that this money should be made available to the State Highway Department, then the parties holding it up, should be made to turn it over at once. This decision may be handed down this week; if it is handed down, and this money is not handed over, then we will have reason to feel that this party is not dealing right by the people of the State and by the State Highway Department.

I sometimes hear a great deal about the autos tearing up the road, and their reckless driving; but I want to tell you that the people who own the autos are paying for their pleasure. I will give you the figures on this, so that you may be able to judge for yourselves. They have paid into the State Treasury this year \$982,000. It will reach a million dollars before Saturday. One million dollars for the maintenance and construction of the State highways, the first five months of the year, and this money tied up by a mere technicality. I am not finding fault with Mr. Powell in protecting himself. I occupied the same position in Lackawanna county that he does in the State. If I considered a bill illegal, I consulted my attorney before paying out the money; but when protected by my attorney and the order of the Court, I paid it out. And this is what they should do.

In 1912 we received from auto licenses, \$592,000; in 1913, \$862,000; in 1914, it will undoubtedly reach the splendid sum of one million, one hundred thousand.

Now the recent Legislature passed the new "Township Act." It gives the State Highway Department the right and power to send out engineers to assist the supervisors to plan their roads, construct grades and culverts, etc., get out blue prints, and all free of charge. It was intended to get the State Highway Department and the local

townships to work in harmony, and I think it will bring about better roads in the State. I have advised the supervisors, where I have attended their meetings, to look into this matter, and take advantage of it. They can do this better than the State Highway Department, or at least as well, because all it requires is good horse sense. I have advised them to organize and come down to the Legislature, when it is in session, and explain to them the necessity of better roads throughout the State.

Now, gentlemen, if you know of anything relative to the highways, that I can throw any light on, I will be very glad to answer any question that may present itself. I know the deplorable condition in which these roads are.

COW TESTING ASSOCIATIONS

By PROF. F. R. STEVENS

Agriculture is not exact, either as a science or an art. The great problems of breeding and fertility and the certainty of irregular weather conditions takes agriculture for all times out of the class of exact business and places it for all times in that class of business which is speculative. The time will probably never come when we can depend on producing milk at a given price or oats at so many cents per bushel. The problem of marketing at a given selling price is difficult, but easy compared with the establishment of a producing price. Agriculture is hazardous, but that fact is not warrant for the hap-hazard methods employed by some of us.

My topic today is Cow Testing Associations, devised to increase the profit in the sale of milk and its products. Much might be said about the retail price of milk and the percentage of the price which finally reaches the producer, but that is another story, I am to deal with the cost of production.

It is true in a sense that a cow is a machine, but all cows were not made with the same pattern. A cow can take a given amount of food and with it produce a given amount of milk. The amount depends upon breeding, care and feeding. The amount remains fairly constant each year while the animal is kept in good health and the profit depends upon the cost of feed and price of milk. Under the present conditions it takes a pretty good cow to pay feed, labor and interest bills. Labor has increased decidedly. The common commercial feeds which are used in our dairy have increased in the past 16 years 69 per cent. as follows:

Kind of Feed	1898	1913
Hominy feed,	\$16 00	\$31 00
Corn meal,	18 00	34 00
Gluten meal,	16 00	32 00
Cottonseed meal,	23 00	36 00
Corn and oats,	21 00	35 00
Wheat feed (bran),	16 00	30 00
Middlings (wheat),	20 00	35 00
Ground oats,	23 00	35 00
Boston wheat feed,	17 00	29 00
Linseed meal,	23 00	37 00

The increase in milk, according to Borden's price has in the same length of time increased 39 per cent. To be exact the price is herewith given:

Borden's Flat Price for Milk	1898	1913
January,	\$1 35	\$1 75
February,	1 30	1 65
March,	1 20	1 60
April,	1 00	1 40
May,	85	1 15
June,	1 70	1 00
July,	80	1 25
August,	1 00	1 35
September,	1 20	1 50
October,	1 30	1 90
November,	1 30	2 00
December,	1 35	2 00

It is clear then that cows which might have been profitable fifteen years ago may now be kept at a loss.

There is no other vital factor connected with the production of milk except that of profit. There is a very prevalent opinion held by too many farmers that the fertility and up-keep of a farm requires a certain number of cows. This belief is so generally prevalent that one of our great agricultural leaders recently made the statement that in a large percentage of our dairies, milk was a by-product. This theory is exploded. Every person working with the soil realizes the value of manure as a fertilizer but it is not an essential. Cover crops and commercial fertilizers may take its place. In fact on many of the farms which have produced records in crop production, no cows were kept or manure purchased. The fertility was maintained by the liberal use of cover crops and commercial fertilizer, and if our dairies are to be put on a fairly profitable basis, we must keep in mind just one thing, namely, the profit in the production of a quart of milk. The State Experiment Station at Geneva, N. Y., has for some years kept very careful records showing the cost of the production of milk. A herd at that station is made up of Jerseys not entirely pure bred and is in no way an expensive herd, one which any farmer might equal with moderate means by careful selection and breeding of his cows and when he obtained this herd he would be proud of it. In 1906 it was found that the best cow in that herd produced one hundred pounds of milk at a food cost of

48.17 cents. With the poorest cow the one hundred pounds of milk cost 134.1 cents. The following year, 1907, with the best cow the cost was 60.1 cents and with the poorest cow 157.8 cents. In 1908 the cost for the best cow was 65.5 cents and the poorest cow 183.8 cents. One of the first cow testing associations in the East was at Delhi, N. Y., formed in 1910, and they give some very interesting results of that association work. For instance the creamery record at that place shows that 535 cows in the Delhi Association have produced 270,179 pounds more of milk than 536 cows from the same farms had before the association records were kept.

The Ithaca Association, in New York state, shows some very interesting statistics through a series of four years as a result of the Cow Testing Association. The following table shows the increased profit over their feed:

	Herd No. 1	Herd No. 2	Herd No. 3	Herd No. 4
First year,	\$18 04	\$38 04	\$22 86	\$13 36
Second year,	44 63	41 71	33 60	19 62
Third year,	36 02	48 32	57 40	50 59
Fourth year,	40 81	54 84	46 59	51 73

The difference between these cows was purely individuality. It is very clear, therefore, that at the present price of milk the poorest cow at the Experiment Station quoted above, together with several others were being kept at a decided loss. They do not pay their own feed bill alone to say nothing of labor and interest on capital and depreciation. Facts such as these concerning every dairy should be in the hands of the owner. It is a very easy matter then, to take from the herd those which are unprofitable, retain those which are making the profit and breed up the herd from the profit making cows, headed by a sire that will increase their production in the offspring.

I know of only one way in which there is a hope of bringing about this result, and that is by the formation of Cow Testing Associations. It is entirely possible of course for each farmer to make such records himself, but the experience of years has taught us that the average farmer is not included to attend regularly to such detail work. However, throughout the country there is being organized Cow Testing Associations which do give this information.

Cow Testing Associations are organized very simply by a number, usually twenty-eight dairy farmers in a given locality and the employment of a clerk whose duty it is to visit one herd each day, record the amount of milk from each cow, test samples of milk from each cow and determine the solid content, compute the cost of feed given each cow and so determine the profit from each. Repeated records have shown that monthly tests of this kind and this average throughout the lactation period comes very close indeed to the actual number of pounds produced by each cow each year. These associations are usually successful in that they bring about the ex-

change of opinions, discussions of the question of markets, most suitable breed of cattle and other problems, the solution of which helps to increase the profit of the dairy farms. In the great dairy county of Bradford, one such association was organized something over a year ago, but in order to get the necessary 28 dairy farmers, it was necessary for the agent to travel over a territory having a radius of thirty miles. The benefits of this association were so clearly apparent after the work was begun that others seeing the advantages to be gained, applied for membership and two associations were formed in that territory, making the work of the agent considerably less and more effective. I beg leave to incorporate in this, some comments by the clerk on this work which will be of interest.

"Since such a wide area had to be covered to organize the association for its first year's work, with but two or three exceptions only the most progressive men in a community are in the association, hence only a few of the so-called boarder cows are being found and many of these have already been sold. Also, with only one or two exceptions the 29 herds are either pure bred or grades headed by a pure bred sire." Therefore, the years testing work will be more to show a man what are his poorest cows and what are his best ones so that he may know when he increases his herd what cows to sell and what calves keep. Another point in regard to the breeding is that by having their cows tested, where they have a cow and her daughter both being tested, the farmer can note the effect of his sire. This has been shown already several times, where the calf is better than the dam, but the sire was sold for beef before the association started, because it was only by testing that this difference was noted.

The statement is frequently heard that a one day's test is not a fair criticism by which to judge one month's work. Edwin Wright uses the same kind of scales as the agent and milks regularly, each milking of each cow in his herd is weighed and recorded. One month when his 24 cows were at about the best part of their lactation period, he compared the one day's average with Mr. Wright's total for the month and the greatest variation of any of the cows giving 600 to 1,000 pounds of milk in one month was 25 pounds. Some of his cows giving a little above and some a little below the agent's figures. Some farmers not in the association have a cow tested once or twice in her lactation period, or maybe only once or twice in her life and then tell their neighbors that this cow tests — per cent., but this may be far from what a cow averages in a year. For instance the most variable tester in the association while giving over twenty pounds of milk per day varied in her test from 31 per cent. to 61 per cent. Of course this is the worse variation but it shows how unreliable one test is.

I have found that a cow often is a boarder, not because she does not have it in her to produce the milk or butter fat to pay for her keep, but because of the man who feeds her. She may be fed a proper amount of roughage but skimmed in her grain, thus not bringing the best out of her or else she may get too much grain which is out of proportion to the amount of milk she gives.

The most economical producer of milk in the association have been the Holsteins and the Ayrshires, while the cows that produce a pounds of butter fat the cheapest are the Jerseys and the Guernseys. Also the cows that are producing either milk or butter cheapest and

bringing in the greatest profit to their owners are those producing the largest amounts. A cow producing ten pounds of milk per day requires practically as much roughage as one of the same size producing three times as much. It takes the same amount of milk or butter fat from either to pay for this roughage, hence the cow producing the most has that much left over and above that of the ten pounds per day cow to pay for her grain and bring in a profit.

In a comparison of the roughages, clover and alfalfa hay have required the least amount of grain to be fed with them. However, there is one exception. Mr. Howland has excellent oat and pea hay. He fed good clover hay most of the winter and then he changed from the clover to the pea and oat hay and on the same grain ration, most of his cows showed a slight increase in their daily milk yield. Twenty-five of the 29 farmers in the association have silos, but this past year on account of the early frost there was not as much silage as usual, and the corn crop had to be put into the silo before mature, so that the corn silage did not show up as well as it would have if it had been of a better quality. Every farmer with a silo has to use some oil meal with his silage in order to make it laxative enough for the good health of the cows. Most of the clover during the winter of 1912-13 was killed by frost so that the dry roughage was mostly timothy. When the silage was gone and timothy hay the sole roughage there was not as much of a drop in milk yield on the same basis of grain as might be expected. That is, when they put enough oil meal in the grain to make the droppings as loose as they were when silage was fed. When the grain ration was kept laxative all winter it showed to quite an advantage both in the health of the cows and in their milk flow. Those cows whose bowels were not kept loose being prone to occasional feverish udders, indigestion and in lower milk yields. The point of keeping a cow's bowels in loose condition, both before calving and while in lactation cannot be emphasized too much.

With four or five exceptions, the farmers used balanced rations, either of mine or their own make up. These were all computed with the ideas in view of bulk, palatability, variety, cost and healthfulness of the cow. Some of the practices of the farmers which go along with good feeding and help increase the milk production are:

- 1—Regularity in milking.
- 2—Having the same milker for each cow all the time.
- 3—Regularity in time of feeding.
- 4—Keeping the cows well bedded.
- 5—Keeping the cows curried off.
- 6—Feeding salt daily or keeping it where they may have access to it at all times, also water.
- 7—Kindness to the cows.
- 8—Allowing a rest of four or eight weeks between lactation periods and feeding during this time.

This is the ninth month of testing and almost without exception, the farmers are satisfied. A renter who was in the association at the start, but since has left the farm said that if he had been in the Cow Testing Association ten years ago he would have had a farm of his own by this time instead of being a renter with scrub cows and never improving them all this time. Another renter could not be

persuaded to join the first month when we still lacked a member. The next month he joined the association and now is not only expecting to join for another year, but has persuaded his father to join for the next year. Since the association has started four of the farmers have started to test their cows for the Advanced Registry.

Nearly every herd has its surprises. What was thought to be the best cows in the herd are often proving to be only average cows, while some cow that was little thought of is proving to be among the best.

The association is now being organized for another year into two associations where there was but one. It took three days to organize on this side of the river and it will probably not take much longer on the other side. Two of the things that have helped to make it easy to organize for another year are, first, the stress laid on the work at the Farmers' Institute during the past winter, and second, the advertising given the association by the county papers which have published each month a list of the cows giving over forty pounds of butter fat during the month. There are only five associations in the State. Next year over half those in the State will be in Bradford county."

I am speaking now to the leaders of the agricultural societies of various parts of Pennsylvania, and I wish to urge upon you the importance of this movement. I do not know of any one thing that can be done that will tend more to increase the profits of the dairies in the State of Pennsylvania. It will also start a trend of thought among our farmers toward the detail financial side of farm work which will be helpful to them in more ways than one. We face a peculiar situation in forming any kind of an organization among our farmers. They recognize the logic of argument in such matters as those, but they are very slow in forming effective organizations to carry a scheme into effect. The one thing needed to bring this about is local leadership. In this matter, you who are constantly coming in contact with these farmers must have judgment in the selection of leaders. Those who are intelligent, successful and have the ambition and ability to organize and even then you will find it necessary to actually begin the organization of these associations yourself, seeing that a committee is appointed, that proper blanks are supplied by the authorities and that the local work is well in hand before it is turned over to the association officers to carry on. It is a new line of thought to many of these men and it is necessary to stay with them until they have begun the actual work and are familiar with it. This means expense and time. It means patience, too. So does anything worth while. But I wish to urge here today a co-operative and systematic scheme for the formation of these Cow Testing Associations throughout the State.

In this connection, I want to commend most heartily the action already thoroughly begun in inducing the farmers of the hill lands of northern Pennsylvania to infuse into their stock a goodly portion of Ayrshire blood. One of the foundation breeds of dairying is to adapt a breed of dairy animal to the various types of soil. For generations the Ayrshires have been bred on the steep hills and mountains of Scotland and have therefore developed traits that make them eminently fitted to this hill land. All efforts to increase the grade of

dairy animal is commendable. Scrub bulls ought not to be allowed to exist. It is particularly desirable that we grade up our animals with that type of principle blood best adapted to our locality.

THE VALUE OF VIGOR IN POULTRY

PROF. T. F. MCGREW,

*Principal, School of Poultry Husbandry, International Correspondence School,
Scranton, Pa.*

I wish to say first, Ladies and Gentlemen, that I am in favor of Prof. Stevens' Cow Testing Associations. When I was a boy, my mother gave me a cow, and from the milk she did not take, I got twelve and a half pounds of churned milk. This was one of the first cow testing associations in Philadelphia.

I want to say a word to you about the importation of Chinese eggs. Speculators are trying to prevent the people from buying them by sending out notices that the eggs are not fit to use because the hens have not been properly fed on a wholesome diet. Now don't you people get frightened about these Chinese eggs. Mr. Jaffrey, of Berkley, California, has examined thousands of these eggs, and they are just as good as any other eggs kept the same length of time. They are fed rice and barley, which is called "puddy," and corresponds to the corn we feed our chickens. What they call barley is practically the same thing we call corn. The ground on which they keep these chickens is kept clean; they must keep it clean, or they would have a pestilence, and they have enough English and Germans and Americans at Shanghai to see that there is nothing allowed that would produce a pestilence; besides, they have to use these eggs. I don't know whether you people here are for high tariff, or for low tariff, but the fact remains that the tariff has been reduced, and eggs will come in and corn will come in, and cotton will come in; and we must adjust ourselves to the conditions as we find them. In our school we have students all over the world—China, Japan, Africa and everywhere; recently one of my Chinese students cut out of an American paper that was wrapped around something we sent him, a market quotation on the price of eggs; this he has tacked up on the wall of his house, and he sells his eggs today according to the market price at Philadelphia last January.

The first requisite in poultry husbandry is to get good, vigorous stock; next, select with care; then put them in a clean, dry house; feed them about a quarter less corn, but balance with oats, or wheat, and give them alfalfa or clover hay, and that is all that is necessary except to see that they are kept dry and clean and free from lice, and you will have eggs to sell right along. A friend of mine out in Dakota built a crescent shaped shed, such as they use out there for their cattle in the winter. The chickens got in there one year

and laid so many eggs that he got scared. He tried it another year, and they did the same thing. They liked the alfalfa that the cattle got.

In May and June you are likely to have lice on the heads of the chickens. You can tell it by the "peep" of the little chicks, and you will find it very easy to get rid of them. One gallon of sweet oil will save a million chicks. If you have lice, you will lose your little chicks. Use a few drops of sweet oil, and save them.

I have been asked to say a few words about poultry husbandry. I was only sixteen years old when I joined my first poultry organization, and my first dairy association. Get together in your organization and talk things over and help each other. It will pay in your sales next year. That is what we are here for—to help each other. Give a helping hand to the man who needs it; it will repay you.

Among the misfortunes of the poultry business are the unwarranted claims of its greatness, made without due consideration for varacity and usually with purpose of selling you something that you may have but little or no use for. You might start in the poultry business with a small house, costing on an extravagant basis, \$40.00 and twenty-five hens, costing \$50.00, and by good management pay the entire cost inside of one year, if the hens are good layers. If, however, you permit yourself to be led into needless expenditure, you will spend more than another hundred dollars on equipment that is not productive. You and the hens will consequently be kept quite busy for two years to pay for the needless expense, and by then you will be ready to say "Poultry keeping does not pay." The truth is that there has been extravagance; twenty-five hens cannot pay for their own keep and an expenditure of \$140.00 each year.

A world wide booster wrote a short time since that poultry keeping was a blessing to the farmer, because there was sold each year in the United States, three billion dollars' worth of chicken feed. If true, which it cannot be, this would be almost five times as much as the government census tells us is the total yearly value of poultry and eggs, and more than three times the estimate made last year.

Facts are what you want to know; and these are that poultry pay better, dollar for dollar expended, than any other livestock. Mr. Mapes, of Middletown, New York, claims that on his farm four hundred Leghorn hens, valued at \$2.00, each paid him better than did \$800.00 worth of cows, managed and fed by Mr. Mapes himself, who is an expert with both hens and cows. We know that under certain conditions cows in some localities will pay best, and that in other localities the same would be true of the hens.

"How shall we make more money from our hens?" is a natural question to ask. This question we shall try to answer. To gain improvement nothing is of equal importance with vigor, and for this reason I have selected "Value of Vigor" as my subject.

In the growing of livestock of any kind very much more depends upon the vigor of the stock than many imagine. The great principle of breeding livestock of any kind lies in:

Hereditary vigor transmitted for more than three generations through the most vigorous individuals.

The proper selection and mating of the most vigorous of all the stock.

The proper rearing, care and feeding of the young stock.

The careful culling or selecting of the most vigorous of all stock.

Professor Lewis has said that constitutional vigor means health, activity, and vitality. A good hen is expected to lay in one year five times her own weight in eggs and to consume thirty times her own weight in feed. Without constitutional vigor this would be an impossibility. A hen at large will walk several miles in a day, hunting for food. If she has not the constitutional vigor to do this she cannot stand the strain of such violent exercise and lay eggs as well.

Next to vigor, in importance, is environment, which has considerable influence. Environment, to be the best, must sustain and improve life. Lack of room, air, cleanliness, and proper ventilation have the same effect on poultry as filthy tenement houses have on people. Fowls that are vigorous and active and that have a sound constitution are rarely, if ever, afflicted with disease. A fowl's physical training, says Dr. Holmes, should begin with its grandparents. Scientific investigators declare that they would not serve a fowl with a crooked breast bone on their table, as this indicates lack of vitality, and that they would not care to eat the meat of the fowl so weak as not to have solid bone formation.

In the breeding of livestock of all kinds there needs to be a great deal more of consideration given to it than is usually agreed to. The English people have shown themselves to be the most perfect or the most expert in the breeding of livestock of the highest character. One, quite successful with several kinds of livestock, has said that there is no royal road to success. Said he, "The only road to success is a fixed resolve to continue irrespective of discouragement, until you have succeeded in producing or in breeding a specimen or specimens capable of winning continually in the keenest competition."

To be able to do this one must have a natural inclination for the work and must, first of all, understand the proper formation of the animal to be produced—must know when it has the proper proportions and how to produce them.

It is rather peculiar, yet true, that the best of years ago of a certain kind of stock stamps its imprint on the product of the present. For instance, the cow Lucky Farce, queen of Jerseys for her age, owned at the Dalton Farm, traces fifty times to the great cow Commassie and seventeen times to Eurotas, a noted dam and the first cow to make a record of over 700 pounds of butter in a year. In the same way the blood lines of a few individuals will be found prominent in the greater part of all the heavy egg producers of the recent American egg-laying contest. For instance, all the males and all the females in a flock of more than three hundred, trace back to the original pen of four hens that won the gold medal in England in 1911. This would indicate close inbreeding, but this is not at all necessary, because one hen, the heaviest egg producer of all, was separated and males only from that hen were used. The following year only males from one of the other hens were used, and each instance only the heaviest egg producers were used for producing the males, and each male and each female bred from had the strongest constitutional vigor.

In a letter received last February from the owner of these flocks, he wrote, "I wish I could send you two dozen males that we have out in the brush. I must employ two boys to watch them all day

long to keep the cockerels from killing one another." Whether the hen was first or whether the egg was first makes but little difference. The common cause of their creation may be shrouded in mystery, but of one thing we are surely positive and that is, that there was natural vigor behind them to a perfect finish; and so long as their existence clung close to nature they were strong and prolific and they continued to produce their kind and character that challenged all nature for vigor.

If willing to accept the theory that the Gallus was the one original of all poultry, you will find them now as strong and as vigorous as it is possible for fowls to be, and to your surprise, perhaps, I can tell you that some kept by Mr. Wood, of Washington, D. C., laid quite as many eggs as did his other hens. To show the egg production of other birds, some of them, quails, kept in confinement at Storrs, Conn., laid 47 eggs and one laid 69 eggs in a season. When you are told that the original hen laid but a few eggs, think of the bankivus hens and the quails that are kept so their eggs may be counted.

I trust that Mr. Barnitz will pardon my referring to his subject, but it was my pleasure to visit the natural home of the turkey and the prairie hen in Iowa during the early 70's. There early one morning I rode to the brow of a hill and in plain view I saw scampering before me several thousand wild turkeys, so strong and so vigorous that it took the best speed of a well-trained hunter to carry me in the saddle fast enough to reach the lower end of the hill and to drive the turkeys back between four of us so we could view them for a short time. The oldest of them did outrun the horse, and this without drooping a wing. This was the vitality that nature delivered to us not so many years ago and which we have destroyed in so few years.

When a child I loved to go in the spring to visit my grandmother and aunt, who lived in the hills of Jefferson county, Ohio; then and there the turkeys and chickens did well. Two or three turkey hens kept on the farm would accept the visit of the wild toms that answered their calls and came to them. Almost every poult that was hatched would live as did the young chickens and the greater part of all the feed given them when young were the scraps from the table and cornmeal moistened with milk and thrown to them in the grass. Now, the young turkeys must have the most careful attention and be coddled like hothouse plants and the greater portion of all the young chicks must have equal care and attention.

We little think of the enormous value of small things. If, perchance, each of the three hundred million hens of the United States would lay three additional eggs each year the amount received for those eggs at 20c a dozen would be more than fifteen million dollars—more perhaps than all the eggs produced each year in the State of Pennsylvania. This can readily be accomplished by a system of culling closely and breeding for vigor.

In one of the strongest papers written lately we found the following statement: "No feeding formula has yet been produced that will make a weak anemic hen lay a large number of eggs." A strong vigorous hen, on the other hand, will lay on almost any kind of feed.

Breed for vigor and you are breeding for eggs and you will establish not only an egg-laying strain, but a strain that will lay hatchable eggs. Vigor is the first essential for a profitable flock.

PROFITABLE EGG PRODUCTION

By H. R. LEWIS, *New Brunswick, N. J.*

Mr. President, Ladies and Gentlemen: It is with a great deal of pleasure that I have been able to spend these two days visiting with your Pennsylvania poultrymen. I have enjoyed greatly the trips of inspection to nearby poultry farms under the guidance of Mr. W. Theo. Wittman. I have come to tell you, with the aid of the slides, of some of the methods which have proven most profitable in my own state of New Jersey. New Jersey is, as you know, one of the greatest egg producing states in the Union. We have more large poultry farms probably than any other area or state of similar size. There are four factors which are essential in the successful management of a flock of poultry for egg production. These factors are the man who manages the business, the birds who are the machines used to produce the finished product, eggs, their house or environment, and lastly their food supply.

THE MAN

The man managing any business enterprise is really responsible for the success or failure of that enterprise. Successful poultry keeping is no exception to the rule. Hence a few of the requisites of the man behind the flock are outlined here.

Poultry keeping is a business of details, and an efficient poultryman should be capable of paying close attention to details. It is lack of this one quality more than any of the other which has doubtless caused most of the numerous failures in this work. The poultryman should be conscientious and careful in this work, and a good student and observer. He should make a close study of the habits and condition of his various flocks, and should try to make the individual as much as possible the unit of study. He should be willing to try new ideas, and to profit by the experience of others. Poultry keeping is today in its infancy, as an art when compared with the other branches of animal husbandry, and new thoughts and improved methods of feeding, housing and breeding are constantly being brought to light. "New ideas are what make progress," and progress makes greater profits.

It is important to remember that success in a business requiring constant thought and attention to the various details of management calls for a natural aptitude or liking for the occupation. With this natural love for the work, and a good practical training, the production of market eggs should bring a good living to the poultry-

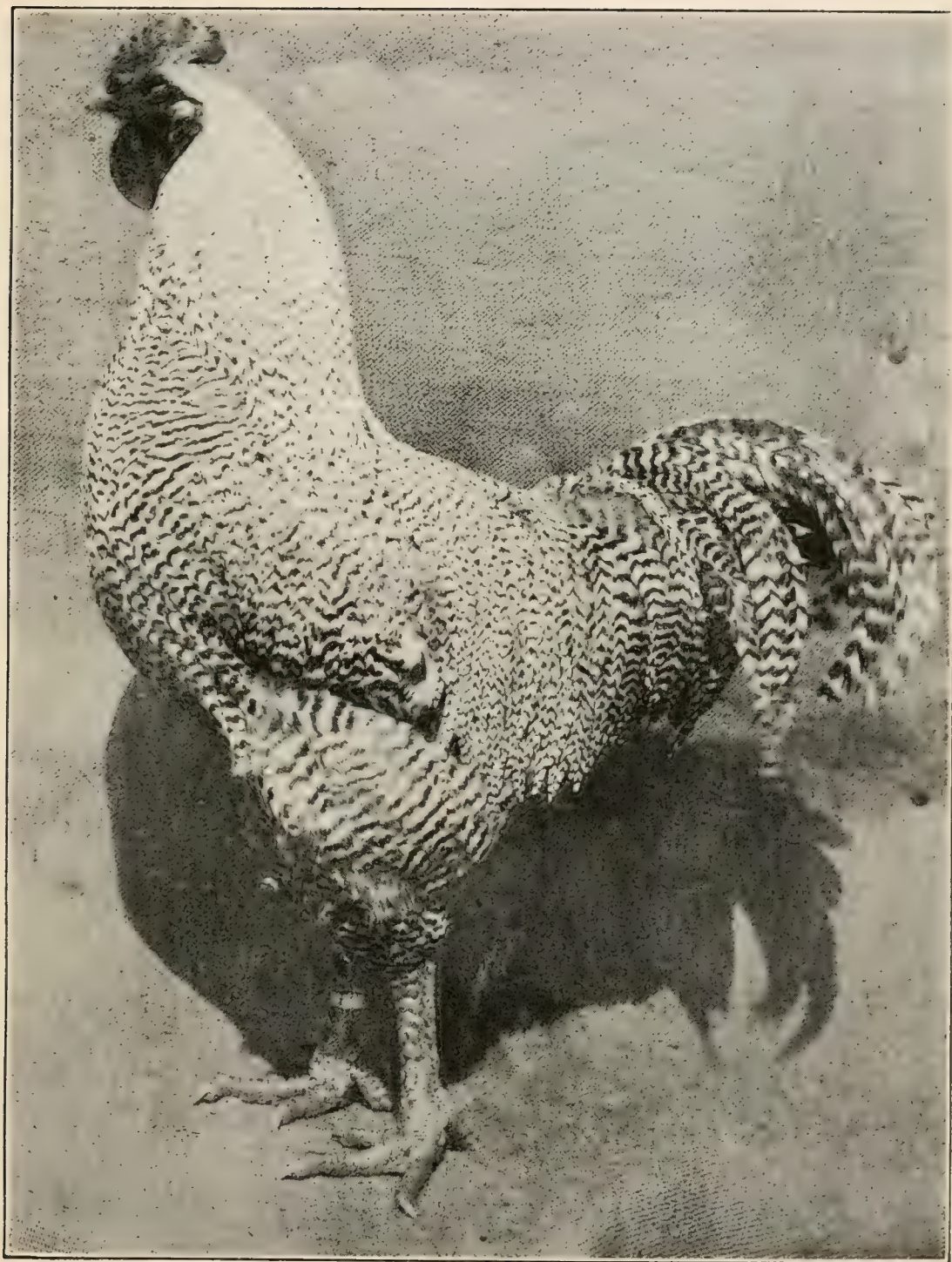


Plate 1. Male, Showing Vigorous Constitution.

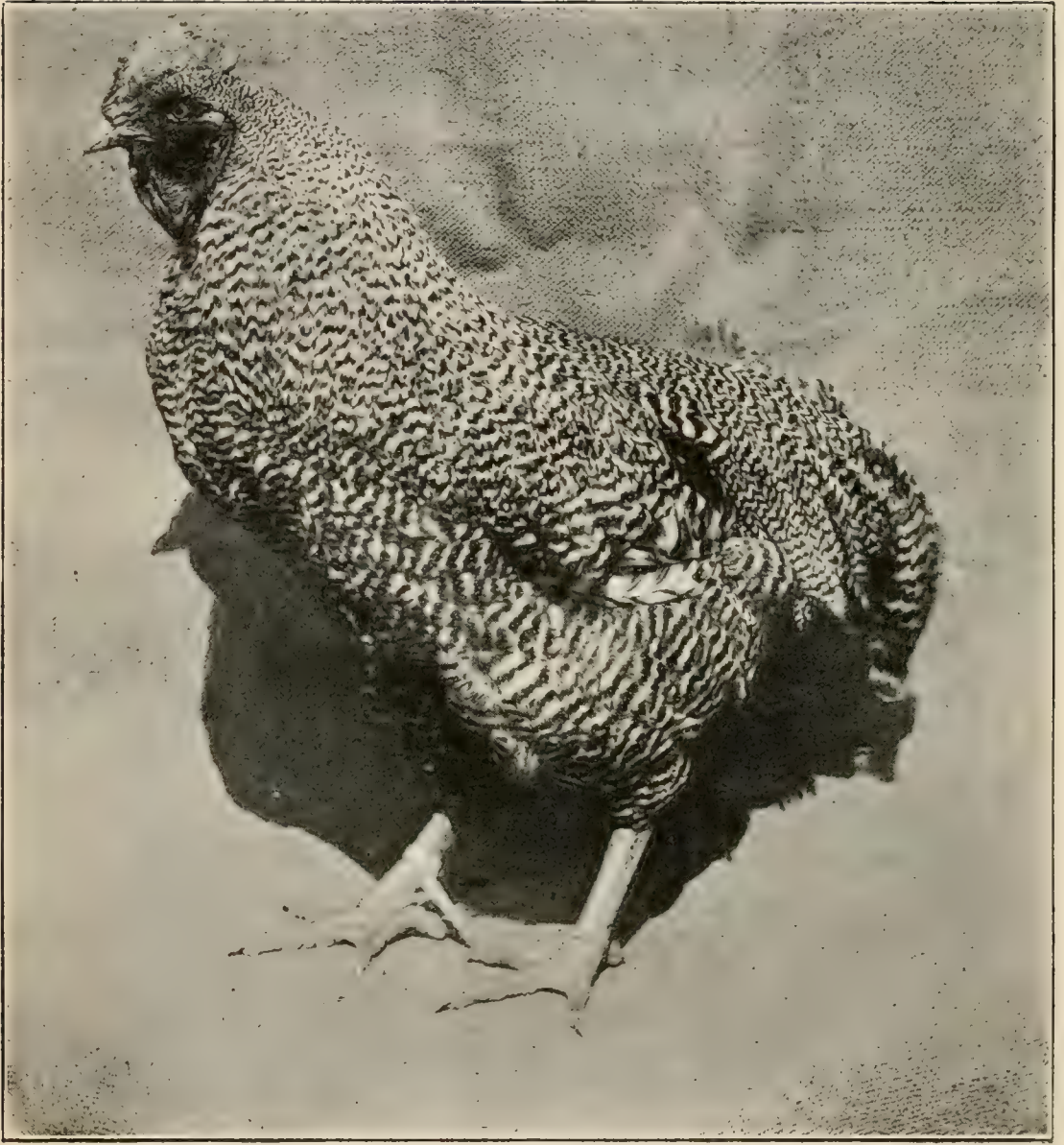


Plate 2. Male, Showing Lack of Vigor.

man, and a satisfactory return on the money invested. Phenomenal profits should not be expected. A yearly profit per bird of from 75 cents to \$2.50 is, on the average, a safe estimate. The actual returns will depend largely upon the market conditions and the price received for the eggs. Where greater profits are realized than those outlined above, much stock and eggs are usually sold for breeding purposes at an increased selling price.

THE BIRD

The birds are the machines which are to convert the raw product, "food," into the finished product, "eggs." Without an efficient and well-balanced machine, this work cannot be accomplished at a profit. The determination of the breed best adapted as a transformer of raw material into the product which the market requires, should be the first consideration. The most desirable breed for any given condition is determined by two factors:

First. The extent of the business.

Second. The character of the markets.

In the first instance, where there is to be a large production, much greater than can be disposed of locally, the total product should generally be consigned to some reliable commission house in New York City, as that is the best egg market in the East. This market pays a premium of from three to eight cents per dozen for white shelled eggs the year round. For this reason the extensive poultry plant in New Jersey, producing market eggs should select one of the breeds which lay a pure white egg. The Single Comb White Leghorn fulfills this requirement more nearly than any other.

In the second place, the poultryman producing usually in smaller quantities for a home market where there is no discrimination between either brown or white eggs will get better results from choosing one of the general purpose breeds. The Plymouth Rocks, Wyandottes and Rhode Island Reds are good examples of this class. After birds of this class have outlived their profitableness as egg producers, their carcass brings considerable revenue when sold for meat purposes.

If one is to be uniformly successful in egg production, he should consistently try to build up his flock. This can be done by selecting only the best females from the entire flock, by mating them to good, vigorous males, and by using this special mating as a breeding pen from which all eggs for hatching should be saved. In this way one will get a continuous improvement that could not be assured if the entire flock were used to propagate the future layers. In other words the time has come for the poultryman to pay more attention to individual birds, and less to the flock as a whole, especially when breeding for future producers. The practice of making special breeding pens in this way is bound to result in time, in large, more vigorous birds, better layers and hence more profit.

(See plates 1 and 2).

Great care should be exercised not to include in these special matings for breeding purposes any birds which have had any poultry disease. Some diseases such as Bacillary White Diarrhoea (Bac-

terium Polorum) are known to be directly inherited, others are known to give to the offspring an inherited weakness which makes them especially susceptible to that particular disease. This is true of tuberculosis, diarrhoea, enteritis, etc. Still others such as roup, catarrh and other general disorders weaken the birds constitutionally, and make them unfit for breeding. Any bird once affected with disease should be conspicuously marked so that it may never enter the breeding pens.

When selecting the females for this special mating, special care should be used to have only birds which are heavy producers. They should be mature birds, pullets should never be used for breeding. They should have rather long deep bodies and a vigorous constitution. Without strong, well-bred birds, a good egg yield is not certain, even with the most efficient management. Hence much time and thought, and if need be, money, should be expended in the improvement of the flock by mating and breeding.

The birds set aside for breeding should be so cared for as to provide for the production of fertile eggs in the breeding season, which will hatch into vigorous chicks. They should not be crowded into small unsanitary houses, nor should they be forced for a heavy egg yield during the winter. The three factors which especially favor the production of fertile eggs are exercise, which can be made compulsory by supplying most of the feed in deep litter on the floor of the pen; green food, which for want of beets or cabbage can be supplied in the form of sprouted oats; and meat scrap, supplied liberally (15 per cent.) during the breeding season, but not excessively prior to the breeding season.

The saving of eggs for hatching purposes should begin about the first of February. They should be collected at least twice a day, and should be kept at a temperature of about 45 to 50 degrees. They should not be subjected to great variations in temperature and should be placed so that they may be turned daily, and protected from the direct rays of the sun. The factor of temperature is especially important, for the germ (embryo) begins to develop at 70 degrees Fahrenheit. High temperatures start the development of the germ, but if heat is not supplied uniformly it ultimately dies. As a result of this, many eggs are later tested out as infertile. Eggs for hatching should be selected with a view toward uniformity in shape, size and color, the idea being to select toward the ideal type of egg for the breed kept.

TIME TO HATCH

The time of year for hatching the chicks that are to be matured for prolific layers should receive careful attention. The retarded hatching of the chicks is very often the direct cause of partial failure, even among experienced poultrymen, for time enough is not given the growing pullets to come to complete normal maturity before the extremely cold weather commences in the fall, which is usually about the last of November. The exact time for hatching will depend, under average conditions, upon two factors:

First, the breeds kept.

Second, the method of growing and the condition of the range.

The light, active Mediterranean breeds are much quicker growers, maturing on good range in from four to six months. They can be hatched, therefore, later than the heavier breeds which require about four to six weeks longer to reach maturity. The Leghorns can be safely hatched from the middle of April to the middle or last of May; while heavier breeds like the Plymouth Rocks, Wyandottes, Rhode Island Reds and will do better if hatched from the middle of March to the last of April.

Success with the incubator calls for a knowledge of the principles of incubation, and of the running of the machine, including the proper care of the lamp, its daily filling, the trimming of the wick and the maintaining of the flame at a height sufficient to furnish the required amount of heat without smoking. The incubation temperature is 103 degrees Fahrenheit. It should not vary in either direction, and a rising of the temperature should be especially guarded against on or about the fourteenth day. The eggs must be turned twice a day from the third to the eighteenth day, and cooled regularly, the length of time depending upon the period of incubation and the temperature of the cellar. The eggs should be cooled longer as the hatch progresses; in a warm cellar in the late spring, often as long as 20 minutes during the last week of the hatch, and usually not longer than the time required for turning during the first week of the hatch. A good test is to cool the eggs down so that they still feel warm to the cheek or back of the hand.

The question of sanitation in the incubator is very important. It is desirable to wash the machine thoroughly after each hatch with a 5 per cent. solution of creolin and to allow it to air for eighteen or twenty hours. This will insure the next hatch against infection by germs of white diarrhoea or of other diseases with which the former brood may have been infected, and the presence of which cannot be determined until the chicks are removed to the brooder.

The question of supplying the proper amount of moisture to the incubator, is often as perplexing as it is important. The final results of the hatch are determined to a great extent by this factor. The amount of moisture required will vary with the season and the character of the room in which the machine is located. Experiments during the past two winters show conclusively that lack of sufficient moisture is very detrimental to the hatch. Moisture can be supplied in two ways, first by increasing the moisture content of the whole room by sprinkling the floor; and second, by the use of a sand tray under the eggs. The greatest amount of moisture was required in these experiments during the last week of the hatch, and it was found desirable to raise the relative humidity at this time up to an average of from 55 to 65, depending upon the season. More moisture was required in the summer than in the winter.

A GOOD FEEDING PRACTICE

Dry Cracked Grains Are the Safest

First 18 hours in brooder, supply an abundance of grit, shell and fresh water with no solid feed. On the following day, first feeding, rolled oats about 1 oz. to 25 birds. For the remainder of the second

day and for the next five days feed five times daily the following cracked grain ration on the floor of the brooder:

- 20 lbs. fine cracked corn.
- 25 lbs. fine cracked wheat.
- 5 lbs. pin-head oatmeal.
- 10 lbs. granulated milk. (fine).
- 3 lbs. fine charcoal.

As supplemental to this ration, feed:

Hard boiled eggs, once, daily.

Sprouted oat tops, twice, daily. (Small amounts).

On the seventh day start feeding wheat bran in hoppers, leaving it before them for about two hours and omit the noon feeding of grains. For the eighth to the fourteenth days:

Wheat bran constantly in hoppers and cracked grains four times daily.

After the fourteenth day keep the following dry mash always before them, and feed grains three times daily:

- 10 lbs. wheat bran.
- 5 lbs. cornmeal.
- 5 lbs. sifted ground oats.

Meat scrap 5 per cent. to be gradually increased during the next two weeks to about 8 per cent.

The above outline is especially valuable for feeding the first eight weeks by which time the chicks will be large enough to eat whole grains and a cheaper ration should then be used.

It is very desirable during the brooding period to allow the chicks to get outdoors on the ground as often as possible, provided the ground is free from snow or water, as they will do much better and will be much hardier and more vigorous. As soon as they can get along without artificial heat, without crowding, the same should be removed.

SELECTION

From the time chicks are hatched until maturity, the flock should be watched with the purpose of removing any birds which show signs of weakness or lack of inherited vitality. It has been proved by experiments that chicks which are naturally weak at birth will never make profitable birds to raise to maturity, either for egg production or for meat purposes. Therefore, it is a good practice to examine the young chicks when they are about a week old and to separate those which show lack of vigor. They should be kept by themselves and developed for rapid flesh growth, and disposed of at the squab broiler age. Another sorting out of the flock is made as soon as sex can be accurately determined, or about the tenth week. All of the males should be separated and those which are not to be kept for breeders should be fed especially for meat growth. If Leghorns are kept they should be sold as soon as the market will take them for light broilers; for after that time, even if they are strong and full of vitality, every pound of meat they take on, will cost as much or more than may be realized for in the fall.

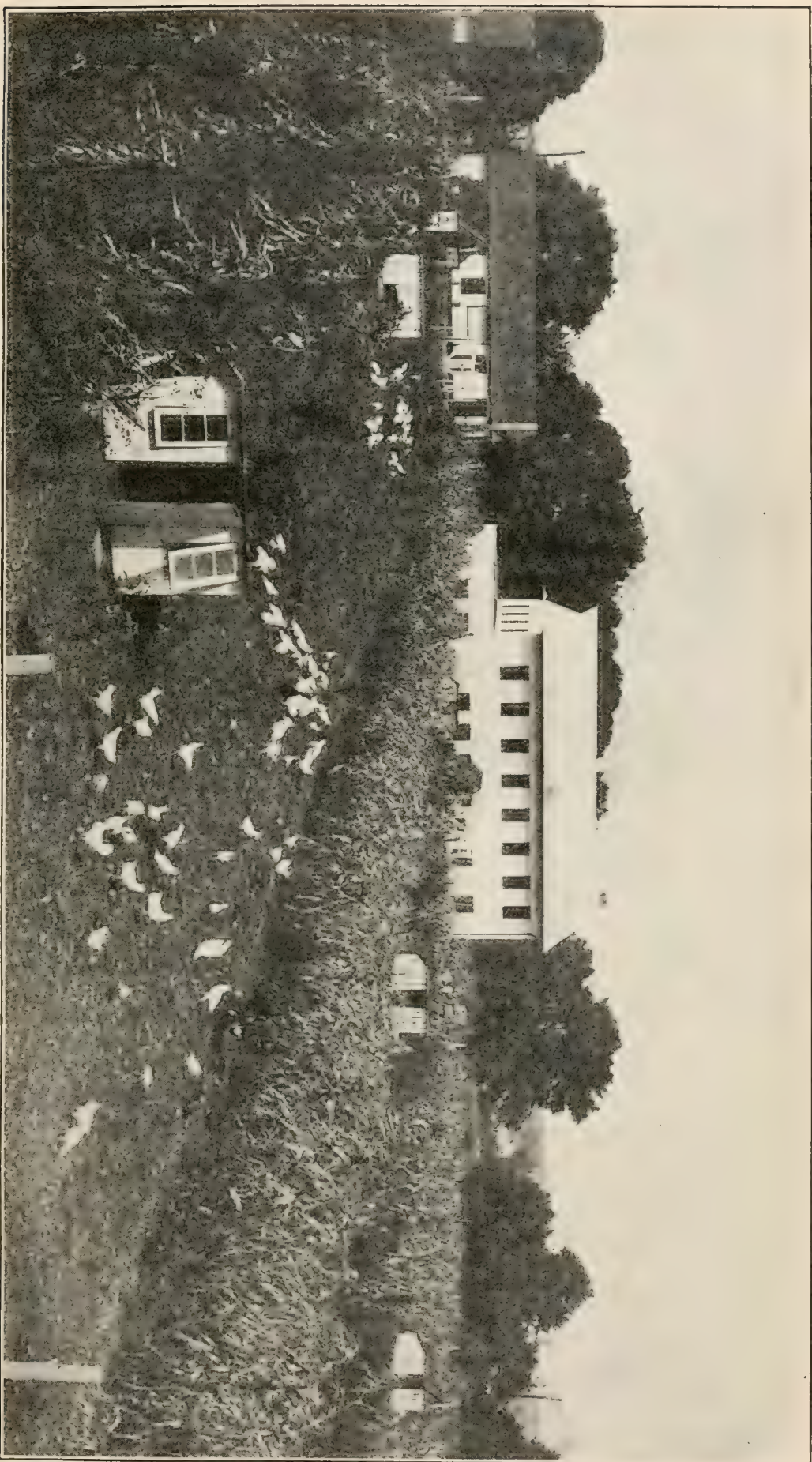


Plate 3. A One Acre Range where Seven Hundred Pullets were Successfully Grown to Maturity.

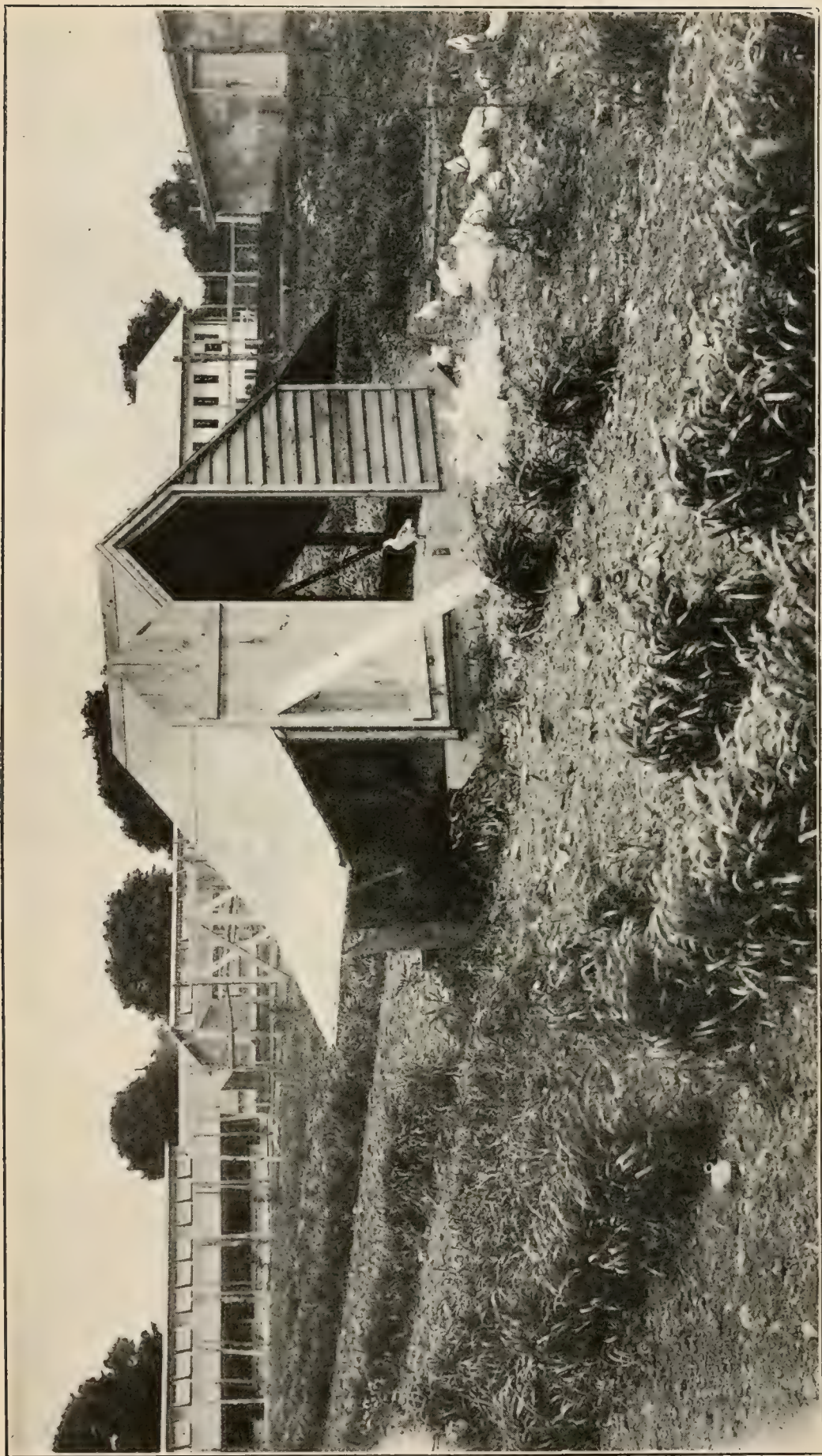


Plate 4. A Type of Summer Developing House, which Gave Excellent Results Under Intensive Range Conditions.

NEW JERSEY STATE

CURTAIN FRONT, INTENSIVE, MULTIPLE UNIT,

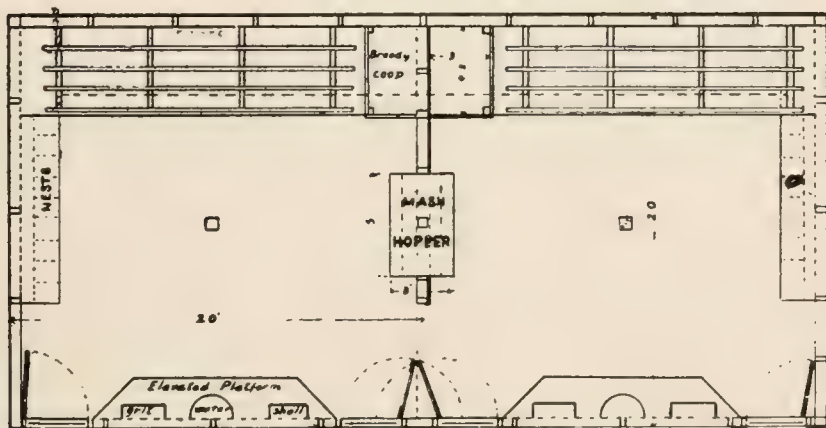
LAYING HOUSE

Scale 1" = 4'

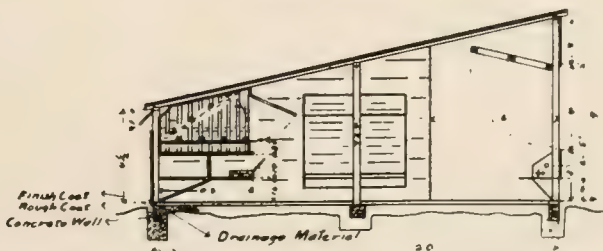
Unit Capacity 20x20=100 Birds

DESIGNED BY
POULTRY DEPARTMENT
NEW JERSEY STATE EXPERIMENT STATION.

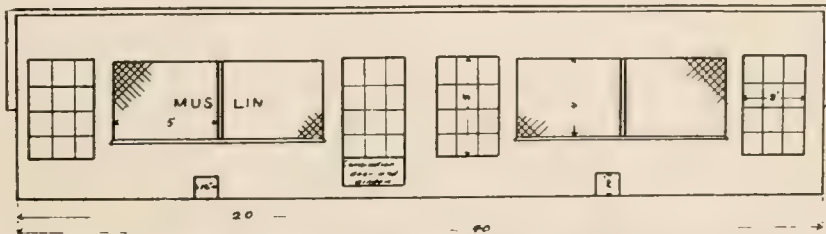
FLOOR PLAN



CROSS-SECTION



FRONT VIEW



H.R. LEWIS

Plate 5. (Plan of Multiple Unit House). The Method of each Ventilation here Shown, was First Devised by Poultry Dept. of Cornell University.

SUMMER REQUIREMENTS FOR GROWING STOCK

After making these two careful selections the poultryman will have a flock of strong, vigorous pullets, ten to twelve weeks old, and the problem from this time on is to mature them to good laying conditions at the right time in the fall.

There are four requirements which are essential for the most economical and certain development. They are:

1. An abundance of range for growing stock.
2. Natural shade if possible, otherwise artificial shade should be supplied.
3. Natural green food in abundance.
4. The feeding of dry mash constantly in large self-feeding hoppers.

(See Plates 3 and 4.)

THEIR ENVIRONMENT

If the best performance is to be expected from layers during the winter, they must be given the most congenial surroundings possible. This means, first of all, that they must be kept in a house which is suitably located and which furnishes the desired conditions at a minimum cost. The location of the plant itself should receive careful consideration, either in the case of prospective poultrymen just starting, or of old plants in which changes are being made.

Given any desirable location, the following conditions should be present in the poultry house:

The essential features of a good house are:

1. An economical but efficient construction.
2. Handy arrangements to make labor easy.
3. An abundance of sunlight directly on the floor of the house.
4. Plenty of ventilation without drafts.
5. Freedom from moisture.
6. Sufficient room for the number of birds kept.
7. Protection against rats and other vermin.

The principles outlined above can be most economically worked out to suit New Jersey conditions in a house conforming very closely to the following type. Of the six different types of roof which are used for poultry houses, the shed roof is the best, as it covers a given floor space efficient and at a smaller cost than any other type. The following plan of a shed roof house 20x40 feet is especially suited to New Jersey poultry farms. Where it is desirable to keep larger units than a forty foot house will accomodate, it is recommended that the length be doubled, making it 20x80 feet with three cross partitions, (one every 20 feet), instead of only one as in the forty-foot house.

(See Plate 5).

The following description of the above plan shows the important features:

Specifications for the Double Unit House: The outside dimensions are 40x20 feet, sills to be 4x6, and to be bolted to a concrete foundation wall eight inches wide and twenty inches deep, which is

laid on tamped cinder or crushed stone, the entire depth of the foundation trench being three feet.

The shed roof type of construction is used with nine foot studding in front and four and one-half foot studding in back. All studding and rafters are 2x4 hemlock or yellow pine. A 2x4 girder runs the length of the building supporting the rafters and itself being supported every ten feet by 4x4 posts, resting on concrete piers. The plates should be made 2x4 material doubled and joints broken.

All outside walls and roof to be single boarded, preferably of eight or six-inch tongued and grooved yellow pine; white pine can be used, but is much more expensive. The roof and back wall should be covered with a good roofing paper; all joints should be carefully lapped and cemented.

The muslin curtains in the front wall are hinged at the top and can be lifted up. The 3x5 glass sash are hinged at the side and open as indicated on the floor plan. One window in each pen should be so constructed that part of the wall will open when desired, thus making a combination door and window. This will greatly facilitate cleaning and filling hoppers, etc., in an extremely long house. (This general arrangements of openings was first recommended by Cornell University).

The dropping boards, perches, and nests are best arranged on the back wall, the perches being hinged to the wall so that they may be hooked up when cleaning, the nests being darkened by a hinged door in front which may be let down when it is desired to remove the eggs.

The dividing partition between the units is built of board and extends from the back wall to within six feet of the front wall; the remaining space is left entirely open. This protects the birds from any drafts when on the roosts. When desired portable light wire partitions may be used to separate the units. A large dry mash hopper should be built into this middle partition. If four or more units are built, it is only necessary to have a hopper in the center of each two units, the other dividing partition being utilized for nesting space. This hopper should be on a general style with a wooden cover at the center. There is an elevated platform under the muslin front which provides room for the water fountain and grit and shell hoppers.

When the house is completed concrete floor should be laid, and should consist of three distinct layers. First a layer of about six to ten inches of cinders or coarse gravel tamped thoroughly to serve for drainage purposes to keep the soil moisture away from the bottom of the floor. Next a rough coat of concrete about four inches thick, and over this a finished coat of two parts of sand to one of cement, troweled smooth and rounded at the corners. Where there is danger of much moisture coming up from below it is advisable to put a layer of tarred building paper between the rough and finish coat of cement. It should be nailed down with flat-headed nails, and the heads of the latter should be left sticking out about one-quarter of an inch to hold the top coat.

Such a floor is moisture-proof, rat-proof, vermin-proof, and easily and quickly cleaned.

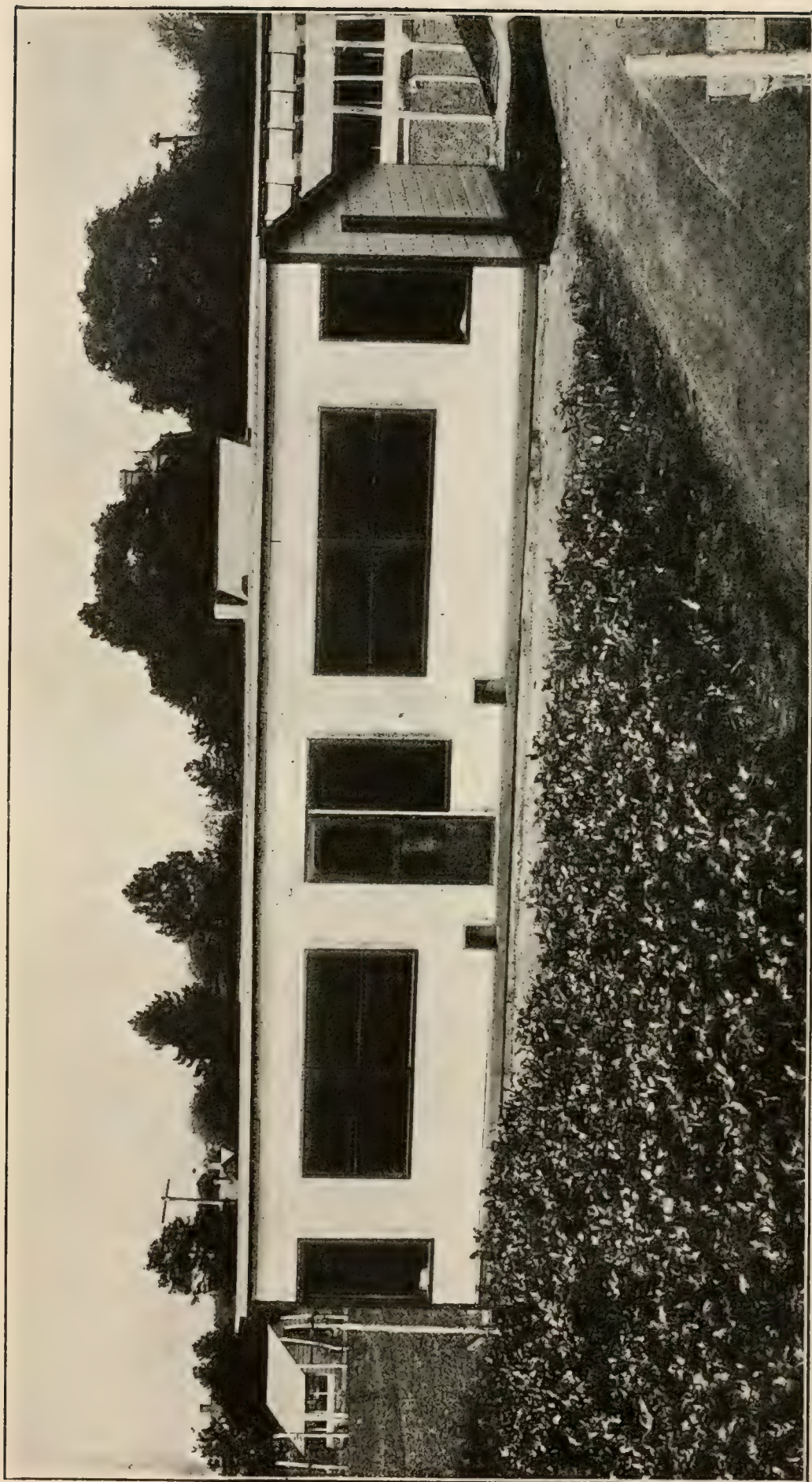


Plate 6. Unit House Completed. Capacity 200 Hens.

The following list is a list of materials which will be required for building a double unit as shown in the working drawings:

LIST OF MATERIALS REQUIRED AND APPROXIMATE COST

Lumber

Sills: 6 pieces 4x6 by 20 feet hemlock.
Plates: 8 pieces 2x4 by 20 feet hemlock.
Posts: 2 pieces 4x4 by 18 feet hemlock.
 2 pieces 4x4 by 14 feet hemlock.
Studding: 9 pieces 2x4 by 18 feet hemlock.
 4 pieces 2x4 by 14 feet hemlock.
Frame for nests and dropping boards: 5 pieces 2x3 by 16 feet hemlock.
Eight-inch tongued and grooved yellow pine boards for roof, dropping boards, walls and nests, 2,200 sq. ft.
1x2 white pine for curtain frames and trim. 200 linear feet.
1x4 white pine for nests, 100 linear feet.
One bundle plaster lath for broody coop.
Nails: 10 lbs. 20 penny wire.
 50 lbs. 10 penny wire.
 20 lbs. 8 penny wire.

Approximate cost of the above,	\$75 54
Roofing paper, 1,060 sq. ft. or 11 rolls at \$3.00,	33 00
Four special sash, 3x5, at \$2.00,	8 00
Muslin, 8 sq. yds., at 20 cents per yd.,	1 60
Hardware, as hinges, locks, tacks, hooks and wire,	4 75
Foundation and floor:	
Cement, 35 bags, at 50 cents,	\$17 50
Cinders or gravel, 30 yards, at \$1.00,	30 00
Sand, 5 yards,	7 50
	<hr/>
	55 00

Total cost not including labor if concrete floor is put in the house and cinders and sand have to be purchased, \$177 89
This gives a cost per sq. ft. of floor space of \$0.222.
A cost per running foot of house of \$4.44.
A cost per bird, allowing 4 sq. ft. per bird of \$0.888.
Adding labor to this at one-fourth the cost of material, the total cost is \$222.36 or \$1.11 per bird.

(See Plate 6).

SANITATION

Regardless of the type of construction of the laying house, if the birds are to be kept free from disease and in a vigorous condition, it is necessary to practice careful and thorough sanitation. This work naturally groups itself along three lines, namely:
The droppings should be removed from the dropping boards whenever they are wet and give off objectionable odors. When by the use of absorbents, the moisture can be kept from them they are not harmful. It will usually be found most economical to do this cleaning at least twice a week during the winter.

The litter on the floor of the house should be removed and replaced with fresh, clean material whenever it becomes wet, whenever it becomes finely ground and loses its property to hide the grain, whenever it becomes soiled and mixed with a large quantity of droppings. An inch of coarse sand should be kept on the floor, and this covered with straw or shavings to a depth of about four to six inches.

Poultry diseases, especially those of a contagious nature, can be largely prevented by spraying the interior of the house four or five times a year with a complete disinfecting solution. The following is recommended as being very effective:

5 quarts cream of lime.

1 pint of creolin.

1 quart of kerosene.

This mixture should be agitated well and diluted with equal parts of water and applied with a force pump through a spray nozzle. A thorough application of this solution will accomplish three things much more quickly and easily than if the solution were applied with a brush.

First. A good coat of whitewash will be applied, thin, well spread and put on with force into all the cracks and crevices.

Second. The creolin will kill any disease germs which may be present in the house.

Third. The kerosene will help to kill and drive out all red mites and to a certain extent body lice. The former can be entirely controlled by this formula, and the latter by the use of a good lice powder in connection with the above solution.

Lice and mites are a severe drain on a flock of laying hens if present in any number. Care should be taken not to let them get established.

A clean house will mean more congenial surroundings and healthier birds.

A COMPLETE RATION FOR LAYING HENS

The following is the New Jersey State Dry Mash and the supplemental rations which are designed for the complete feeding of laying hens throughout the winter. Such modifications as are necessary for summer feeding and for different breeds are also described.

MIXTURE NO. 1.—DRY MASH

Kind of Food	Amount by weight, lbs.	Amount by measure, qts.	Cost
Wheat bran,	200	380	\$3 20
Wheat middlings,	200	240	3 50
Ground oats,	100	100	1 65
Gluten meal,	100	80	1 70
Alfalfa,	100	200	1 60
Meat scrap,	200	176	5 50
	1,000	1,271	\$18 80

The average cost per 100 pounds is \$1.00.

This mash should be kept before the birds all of the time in large self-feeding hoppers. During the moulting season in the fall it is desirable to substitute oil meal for the gluten meal in the same proportion to hasten the growth of feathers. As soon as the birds get on green grass range, the alfalfa can be gradually omitted and the meat scrap slightly reduced in amount. The extent to which the above mash can be cut during the summer will depend upon the character and amount of the range which is allowed the birds.

The mash as given is designed especially for the feeding of Leg-horns; when heavier breeds are kept such as Plymouth Rocks or Wyandottes, especially with yearling or two-year-old hens, the tendency will be for them to take on an excess of fat. Under such conditions it is the best policy to restrict the amount of mash eaten by leaving the hopper open during the afternoon only, thus inducing the birds to work during the morning hours for the cracked grain fed in the litter at the morning feeding. The following modification of the above mash will be found very economical for summer feeding where the hens have considerable range and plenty of growing green food:

MIXTURE NO. 1 A.—SUMMER DRY MASH

Kind of Food	Amount by weight, lbs.	Amount by measure, qts.	Cost
Wheat bran,	200	380	\$3 20
Wheat middlings,	100	120	1 75
Ground oats,	100	100	1 65
Gluten feed,	50	40	85
Meat scrap,	25	21	75
	475	561	\$8 20

The average cost per 100 pounds is \$1.70.

As a supplemental ration to the dry mash, the following grain rations are fed. A scratching ration of whole grain is fed every morning, both winter and summer, about 9 o'clock in deep litter. Its primary object, aside from its nutritive value, is to induce the birds to take a considerable amount of exercise. About 5 pounds of this scratching ration is fed to each 100 birds on the floor of the house or under some shelter where the litter is dry and where there is protection from cold winds. The scratching ration is made up as follows:

MIXTURE NO. 2

Kind of Food	Amount by weight, lbs.	Amount by measure, qts.	Cost
Wheat,	100	53	\$2 20
Oats,	100	98	1 93
	200	151	\$4 13

The average cost of 100 pounds is \$2.06.

At 4 to 5 o'clock in the afternoon, depending on season, a night ration is fed, composed of whole and cracked grains, at the rate of 10 pounds per 100 birds.

MIXTURE NO. 3.—NIGHT RATION

Kind of Food	Amount by weight, lbs.	Amount by measure, qts.	Cost
Cracked corn,	200	120	\$3 30
Wheat,	100	53	2 20
Oats,	100	98	1 93
Buckwheat,	100	66	2 00
	500	337	\$9 43

The cost of 100 pounds is \$1.80.

It will be noted that by feeding a night ration as outlined, the materials are supplied to keep the bird's body warm during the night. The above ration is designed for Leghorns. When feeding heavier breeds, it is desirable to eliminate one-half of the cracked corn and to substitute barley for buckwheat. During the summer months a night ration of equal parts of corn, wheat, oats and barley will supply all the needs for Leghorns. A good rule to follow in feeding the night ration is to give all the birds will eat and then a little more so that there will be some left for them to work on in the morning.

One great advantage of the dry mash method of feeding is the fact that the birds are allowed to balance their individual rations in large measure according to their particular tastes and requirements. The feeding of some succulent material in addition to the grain rations is very necessary for the best success.

DISPOSITION OF EGGS

The poultryman who can successfully market his eggs after they are produced will realize much more than the one who has not that knack or who has not made a study of market conditions. In order to get the most for the product, it is essential that the producer study market conditions and requirements, and if possible, cater to or meet them in as many ways as possible. Nearly all markets, retail and wholesale alike, will pay a premium for a guaranteed strictly fresh article, also for products which are graded according to size and color and are uniform in shape. Most markets will pay an increased price for eggs put up in a neat and attractive manner in a substantial thirty dozen case with ordinary fillers. In some instances it is found profitable to use the one dozen cartoons, and by grading and guaranteeing the eggs at home, where they are produced, the poultryman with an extensive output can soon build up a demand for his particular brand which will insure him a good market at relatively high prices as compared with general market quotations.

TURKEY RAISING; HOW TO SUCCEED

By CHARLES M. BARNITZ, *Riverside, Pa.*
(Illustrated With Lantern Slides.)

The turkey as a domesticated fowl has had but a brief history. Indeed, in comparison with the chicken, it cannot really be called domesticated, for this big bird still nests in the wood, roosts in the swaying tree-top, roams far afield to find natural turkey-food, and oft, at the call of the wild turkey-cock it flees to the woods and the mountains, to ancestral allegiance and life. But the chicken is a domesticated antique. It has been digging up gardens and making the neighbors fuss and cuss for over thirty-five centuries.

The so-called domestication of the turkey began less than four centuries ago, and while the chicken has been changed from the natural to the artificial, has been converted from the little wild jungle fowl into a creation radically different in habits, size, shape, color, variety and productivity with the turkey, nature couldn't be reversed; it could not be taken from the woods and mountains and changed into a machine to meet commercial demands; it could not be raised on the canary-cage plan; and failure of men to note that it is a fowl in its own class, with a distinctive physical constitution that requires special food and environment, has put the United States in the turkey graveyard belt, has knocked the turkey population in a single decade from 6,594,095 to 3,668,708, and where formerly big, chesty, red-headed turkey gobblers "sassed" you from nearly every farmyard gate, today but thirteen per cent. of our 5,579,525 farms produce turkeys, and of these, all but six, at the last census, decreased in product.

TURKEY HISTORY AND ORIGIN

Columbus did not discover the turkey. The Archives of Spain declare that Pedro Nino found the first turkeys, known to Europeans, in Northern Mexico, and bore them across to Spain in 1500 as souvenirs of his trip.

MEXICAN WILD TURKEYS (See Fig. 1).

This was the Mexican Wild Turkey, two other varieties existing, the Northern of our own woods and mountains, and the Ocellate of Honduras, South America, the latter never domesticated and having plumage like the peacock. The ancient ornithologists called the big, baldheaded bird "turkey," which at that day signified "foreign," and had no reference to its origin.

In 1524 some of these Mexican birds were taken over to England, and in the meantime the Cabots had discovered the Northern wild turkey, while exploring the North American Coast and had borne them across to England as curiosities of the wonderful New World. It was soon discovered that the big-breasted bird, as a holiday centerpiece, beat the stuffed piglet; it was bred on the big estates, and an Englishman mated a Northern gobbler and Mexican hen, and offspring from this breeding was brought over to America by settlers and became the foundation of our domestic turkey tribe. We know not how long this strain was bred before it was brought over, but it is declared that this fowl is identical with the English Black Norfolk of today.

The Northern wild turkey hen pranced down from the woods and mated with this English mixture, and thence came the Bronze Americas, largest and most popular turkey. From Black or Bronze, as a sport, came the White Holland, which crossed with other Bronze White Sports has made it almost as large and strong as the Bronze.

Other varieties are the Naragansett, which is two-thirds Mexican and one-third Northern blood; the Slate, half Black and half White, Holland; the Buff, a sport from Black or Bronze; the Bourbon Red, half Bronze and half Buff, and the Black, which is supposed to be the same as the English Black Norfolk, the first domestic strain.

NORTHERN WILD GOBBLER (See Fig. 2).

Thus from two species of wild turkeys have come seven distinct varieties in color and size, especially, much different from their wild ancestry.

The largest wild turkey on record, shot in Pennsylvania, weighed forty-two pounds, but the average size was fifteen to twenty-five pounds. A Bronze turkey-cock, exhibited, weighed sixty-five pounds, and a Texan tom, only ten months old, reached forty and one-half pounds. Craze for color markings has been detrimental, but craze for unnatural size has made many birds flabby—weak breeders—and is one reason for high mortality among poults.



Fig. 1. The Mexican Wild Turkey.



Fig. 2. Northern Wild Gobbler (Audubon).

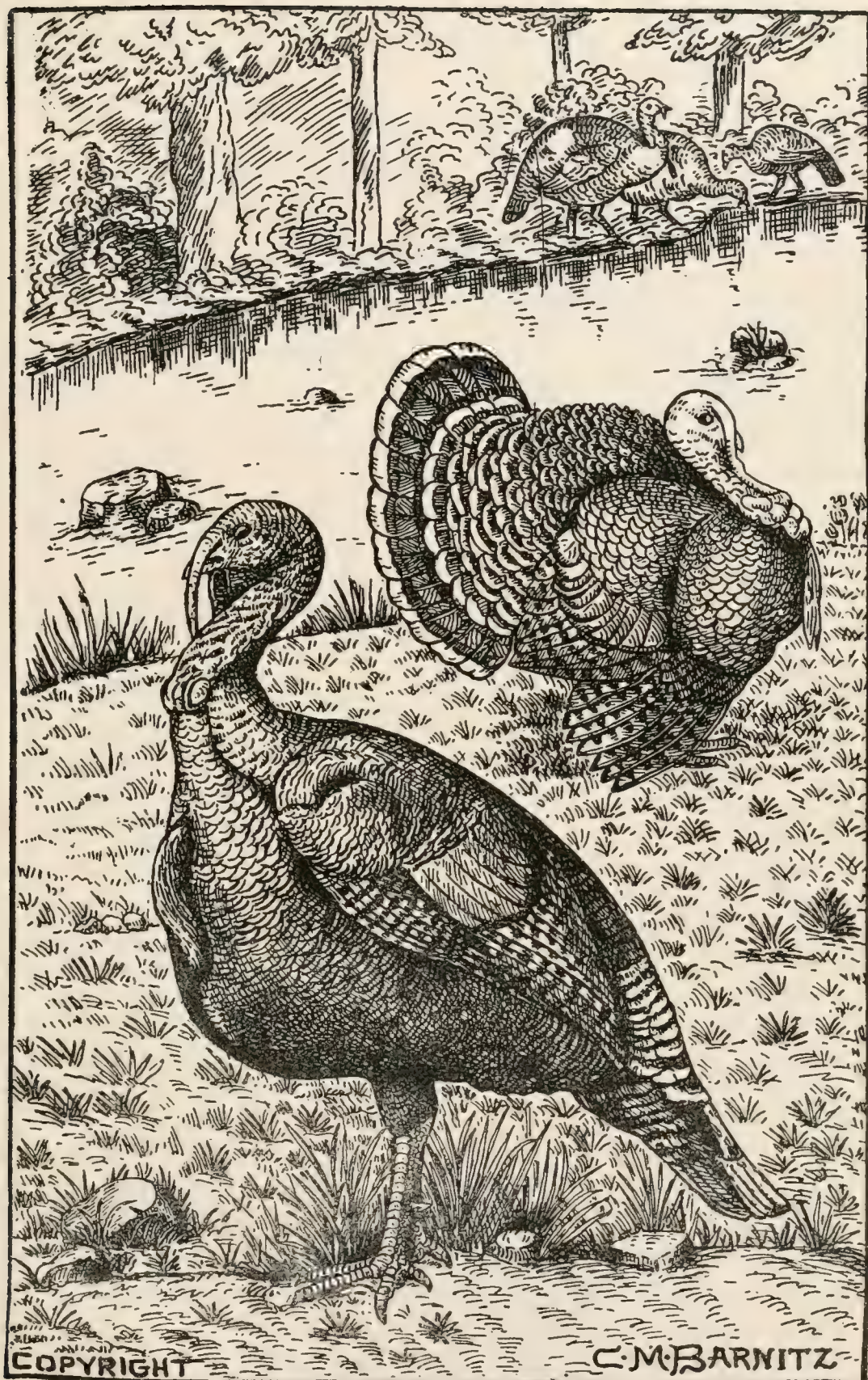


Fig. 3. Model Male Shape.

SELECTING AND MATING BREEDING TURKEYS

In selecting breeders and mating them, wild turkey habits should be considered. In early spring the wild turkey love season is on. There is a great gobbling in the tree-tops. The wild turkey-cocks in all their glittering sheen prance and puff themselves up and spread their fan tails before their lady loves, and after much flirtation and many bloody battles between rival cocks, the victor selects a single, sometimes two mates, and they seek the deep brush to nest. But the nature faker has made a Mormon of the turk, has given him a harem of as high as twenty or thirty females, when from two to eight is enough for him to naturally take care of. In the fall the wild turkey mates separate, the gobbler going one way, the hen the other, and their offspring scattering through the forest and all taking new fresh blood affinities in the spring. This tip to avoid family circle mating was not taken by thousands who are now confirmed turkey pessimists. They bred father and daughter, brother and sister, mother and son, and their process has driven more nails into the turkey coffin than any other. Many farmers varied the program by swapping gobblers with the next farm, or the farmer five miles away, but they forget that their fathers and grandfathers had done this for years before them and they also forgot how far turkeys roam, how flocks mix afield, and how many nasty mixups farmers had over their ownership in the fall.

A turkey hen has been known to travel nine miles to hunt a mate, in the breeding season and this careless trading of birds has made wide areas inbred and has made much of the turkey tribe an easy target for the deadly black-head germ. Two gobblers kept with the same hens often fight and invariably interfere with each other at pairing, and as a hen's whole season's laying is fertilized at once, no poults may result.

(See Fig. 3.)

As to size, medium is the market call, and very large birds make poor breeders. To increase size, use large hens rather than heavy gobblers, as the latter often fail to fertilize eggs, may die during strain of breeding season, and often rip the hens down the sides at pairing. Two gobblers may weigh the same and be like as two peas in a pod, but close examination may show one fat and flabby, small of bone, done growing, and incapable of fertilizing eggs or giving strong poults.

A good breeder shows a bright eye, large head, strong beak, big throat wattles, long, strong neck; back broad, curved, sloping gracefully to tail; wide, full, round breast; strong big wings, heavy drumsticks, long, thick shanks and big feet set wide apart. The body should be like an egg, big end front, and the turkey-raiser should, in particular, strive to produce much breast meat, the turkey's chief charm to bring the big price, and the epicure's delight. Our drawing (Model Male Shape) has been pronounced by prominent turkey raisers in England and America as correct for shape.

The wild turkey with its natural environment, free life, fresh blood and natural turkey food, matures in a season, but the tame turkey, on account of nature-fake breeding and feeding, is not really matured in less than two years, the mating of young, immature stock

being the cause of many failures with turkeys. Many farmers quit raising turkeys because they had nothing to raise them from. They sold the best birds they raised at market and kept the scrubs for breeders, and, of course, these fizzled out.

(See Fig. 4.)

Male and female should not just be mated; they should match, the hen, of course, being more refined than the male, as females generally are. But how often we see puny pullets mated to a grand turkey-cock, or a miserable, immature little tom leading a flock of big, rangy hens. The idea that such a one-sided mating will cover a multitude of weaknesses, lack of vigor in particular, is an over-worked hot-air fancy.

"From nothing, nothing comes," is a maxim that applies to working out problems in flesh and blood just the same as to the sums on the blackboard.

FEEDING STOCK TURKEYS

Those who claim that turkeys should be fed the same as chickens, show their ignorance of the subject. A comparison of their respective digestive systems, observation of their respective feeding habits, and the large mortality among turkeys when they are fed on the chicken plan, certainly prove such nature-fake methods wrong. The common hen seems to have been made over into a machine to grind feed, manufacture eggs and to put on flesh to meet the market demands of this commercial age. She has a great capacity for grain and a powerful digestive apparatus. Some consider her a sewerage disposal plant that can work over the worst rot into the pure product. It certainly is surprising what a hen can eat and yet survive.

Not so the turkey. The turkey cannot be kept on the hog-pen plan. When yarded with chickens and fed on the same ground, it soon succumbs. It cannot be denaturalized, and its system abhors filth. A post-mortem shows the turkey's crop more delicate, and the tube or stomach between the crop and the gizzard, longer than that of the chicken, and the gizzard and intestines also not of such strong, coarse structure.

(See Fig. 5).

Nature thus intended that the turkey should subsist mainly upon protein and not fat-producing carbo-hydrates. It needed the blood, bone, muscle, stamina, thick-feathering, to stand the exposure of the wild and the strength of wing and fleetness of foot to escape its many enemies. These qualities are found in protein, but not in grease-makers. Wild turkeys live mostly on protein found mainly in worms, insects, chestnuts, pecans, wild grains, seeds, berries, and green food. Many farmers instead of copying the wild turkey ration, by balancing protein and carbo-hydrates, have fed corn exclusively in winter. Instead of finishing market turkeys with a milk mash, they have fattened them on corn, and the majority, instead of separating the breeders, have fattened them right along with the others, and then wondered why they raised no turkeys the next spring. Much corn fed to stock turkeys causes over-fat, which makes a flabby fowl, blocks the digestive system, crowds the viaduct,



No. 4. Magnificent Bronze—Mated and Matched.

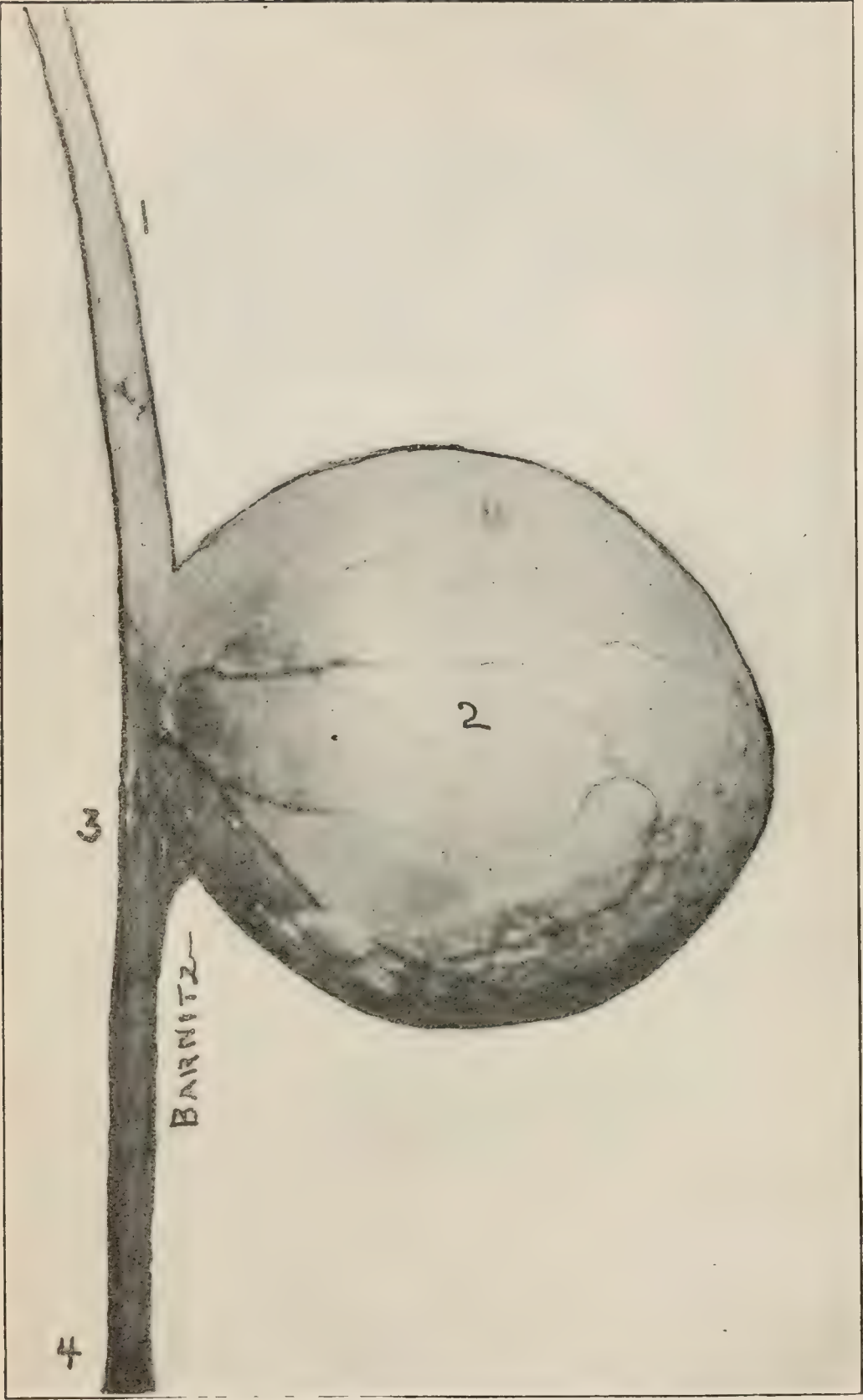


Fig. 5.—Portion of Turkey's Digestive System. 1. Esophagus. 2. Crop. 3 and 4. Stomach.



Fig. 6. Pretty, but not Nature.



Fig. 7. Normal Turkey Ovary and Oviduct.

causes, soft-shelled eggs, weak poults, liver diseases and death. A good grain ration for winter is equal parts red wheat, oats, and corn in litter, supplemented with a moist, crumbly mash of two parts bran and one each of wheat midds, and ground oats, wet with sweet or sour milk. Steamed cut clover, or alfalfa, sprouted oats, waste apples, raw potatoes, beets and turnips should be fed.

Let it be remembered that turkeys on range do not germandize and work for every bite they get; therefore have a scratch shed for them, where they may exercise for their feed and may be housed in extreme weather. Furnish charcoal and grit and feed, just enough to keep them in good condition, and no more.

TURKEY POULTS—THEIR HATCHING, BROODING AND FEEDING

To raise young turkeys to a splendid maturity for market and for breeding, one must follow Nature. When Mother Wild Turkey goes to nesting, she is seldom found by furry or feathered foes. She steals away from her gobbler also, as he has a growing appetite for turkey eggs and young turkey on the half-shell. She creeps under the low pines and fragrant vines and ferns and fallen tree-tops, and there lays her creamy, speckled eggs in the black, damp forest mould, and covers them with her soft feathers and wide wings and warm breast, and sits in shaded silence and dreams of the downy bird babies to come. It is a clean, cool, pure, beautiful nest, and the natural moisture from the sweet, rich earth, aids the perfect incubation of her eggs.

The Creator did not intend the turkey to brood in a band-box. But the nature-faker got busy. Some one's great, great grandmother, think to improve on nature, rolled a barrel out of the cellar, and placing dry straw therein, set tame Mother Turkey thereon. (See Fig. 6). What a difference between this and the forest nests. What a trial to sit in a hot, dry barrel for a month, especially when the barrel gets bughouse, as such often do.

The nature-faker now went a step further toward the turkey graveyard by giving the turkey eggs to the lousy, scabby-legged cluck to hatch, and made her step-mother to tender little turkey poults. This was simply over working Nature—a greedy trick to get more turkey eggs, for Mother Turkey generally lays more eggs when her nest is robbed. But such egg-machine tactics spell failure. The more eggs, the smaller; the weaker their internal structure; the less fertile and the less livable poults.

Our picture (figure 7) shows the natural turkey oviduct, which produces but twelve to twenty eggs per season, the mother generally hatching and raising but one brood. The nature-faker gives the first clutch of eggs to the cluck, and then after the turkey is weary of laying, condescends to give the natural mother the eggs that have the least chance. Thus he spreads his turkey hatching over the whole summer when lice are thickest, heat kills and stunts, and good turkey starting food is dried up.

But the first clutch of eggs gives best poults; spring is God's natural time for turkey poults to kick the shell, for then nature is most prodigal with turkey-poult provender, the youngsters revel in it, and get a fine start before heat scorches turkey vegetation and kills off the best bugs and wigglers. Besides it must be remembered

that the turkey is a large fowl. It must have time to grow large and strong before frost, and this, unnatural late hatching prevents. A dunghill hen is not constituted to hatch and mother little turkeys. Her own egg is much smaller than the turkey's and to incubate this big egg, she has a lower hatching heat than the Mother Turkey. She is a louse incubator and is so bughouse that she cares not if they crawl from stem to stern and her lousy feather-bed is not large nor sanitary enough to accommodate the growing poults, which soon lift her off her feet, and, then, in a month, induced by her favorite rooster, she goes to laying and leaves the poults to be cared for by the bungling human who nature-faked the job. But Mother Turkey was created for this work and her wide wings and warm breast and soft, deep feathers, give her babies roomy shelter until they are big and strong and in full plumage and fly upward and roost with the birds. Then, too, what does a chicken know about feeding little turkeys? She is a scavenger, and has become so depraved that she will stoop to anything to catch the early worm. Her first act in the turkey tragedy is to drag the sweet-voiced little poult into the cozy barnyard, to dig them a meal of filthy maggots, vile worms and germs, and to teach them to drink from the cow-tracks in the microbial mess. Then she leads them to the old slat corn-crib, the chicken confectionery, and stuffs them with grease-maker, and from there she takes them to the filthy hog-pen, where if the hogs don't get them, the microbes do.

But with good old Mother Turkey, how different Her downy darlings are not born in a dusty nest under a lousy, scabby-legged old cluck, but in the fragrant wood, or in a dewy nest among the wild flowers and tall grasses; and they open their wondering eyes, not on an old red mite, or rat-hole hen-coop, but on God's sweet, beautiful world. And their natural mother trills them away from bungling humans and filthy barnyards to green hills and fields afar, where natural turkey-food abounds, and there, amid shady dells and daisies, and crimson clover and crystal springs, they mature into the beautiful birds the Creator intended them to be.

FEEDING TURKEY POULTS

To feed little turkeys successfully, we must follow Mother Turkey's plan. Sit on the fence and watch her feed them in the field. She finds a bug here, a worm there, a clover-leaf yonder, and how the little fellows run to get the tid-bits she offers. What is she feeding them anyhow? She is feeding them protein, the builder; protein, that life-giving principle, that constituent of food that makes red blood and muscle. (See Fig. 8).

This builder, the main food of most bird life, is found in almost pure state in insects, the favorite food of turkeys; and a flock, as they march in line across the field, make a clean sweep of bugs and wigglers; the pestiferous grasshopper and army-worm being their especial delight.

The difference between Mother Turkey's feeding method and that of the nature faker is—the latter feeds mostly carbo-hydrates, instead of protein, and the difference between protein and carbo-hydrates is that one builds, and the other fattens and makes heat. That's why thousands of turkey poults die early in the season and thou-

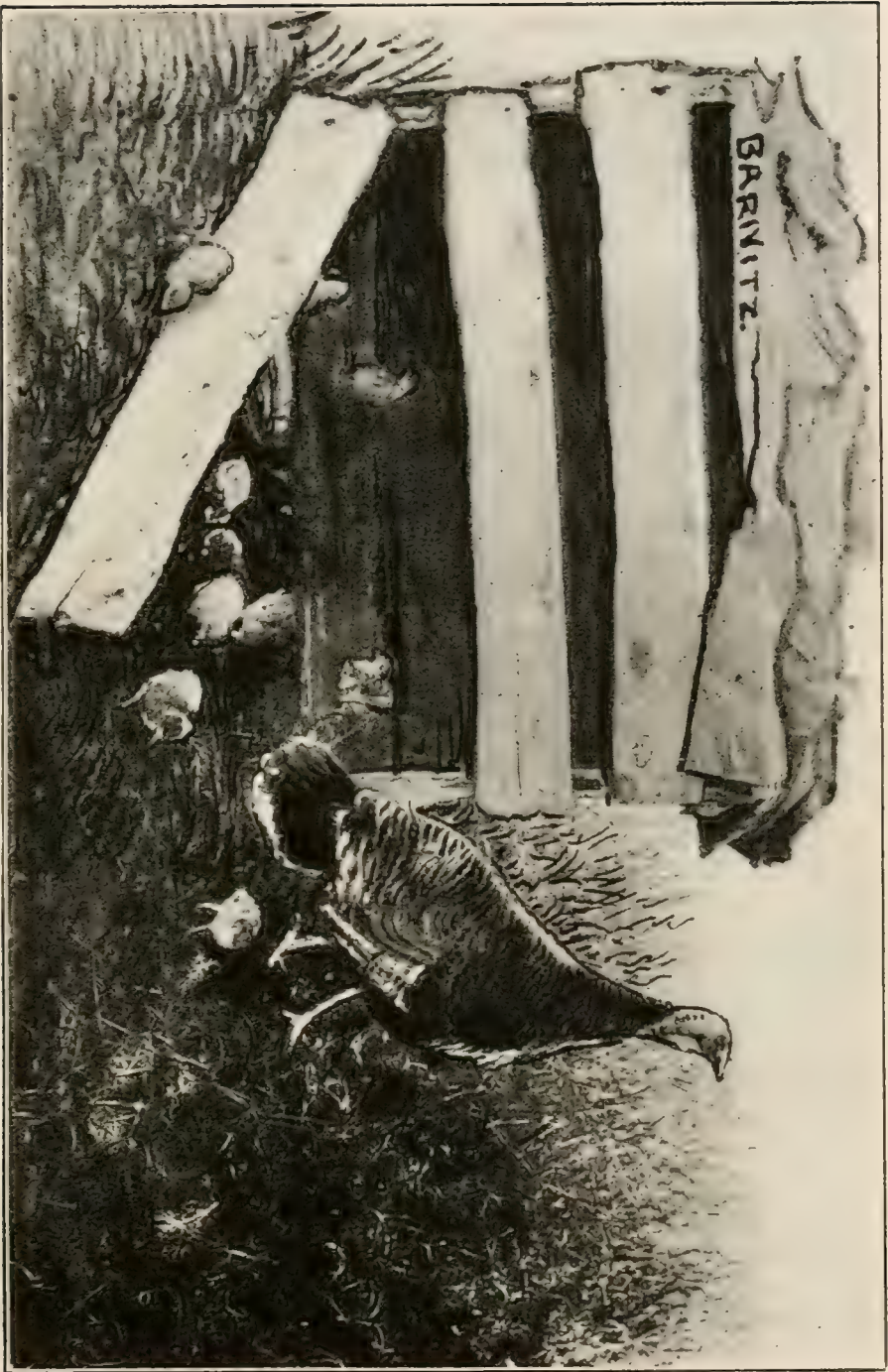


Fig. 8. In Nature's Way.



Fig. 9. Feeding Turkey Poults.

sands of big birds die in the fall; it is excess of carbo-hydrates. The little fellows are stuffed with cornmeal, and the big birds go into the corn fields and stuff with deadly green corn and they wade into the buckwheat; for buckwheat is a fattener, also, and in the end, that's the end of them.

Towards Thanksgiving the farmer drives his flock in, off the range, where they have exercised after every little bit of food they got, and the tid-bits were mostly protein, and he proceeds to fatten them by the allopathic corn process, instead of finishing them by the better, safe and sane milk-moist mash. A lot of them kick the bucket. Then the neighbors and the horse doctor pronounce it turkey cholera,—black bead,—and the death of the big birds is shrouded with mystery. All you have to do is cut one of the victims open, and there you will find an over-sized, mushy liver, covered with spots. That solves the puzzle. The turkey's weak spot is the liver, and corn sooner or later hits the spot.

The farmer's big birds taken off range are not accustomed to grain, to food in large quantity, and especially to rich, concentrated food like corn, which breaks down the digestive system. A reasonable amount of grain is good, if so mixed that protein and carbo-hydrates are balanced, but the trouble is the majority of those who have failed, tried to build turkey skeleton and make blood, muscle, organs and feathers out of grease-maker.

Farmers don't follow this plan with hogs. When Mother Sow presents a litter of pretty pigs, does the farmer start right away to feed them corn, the great fattener? Not by a long shot. He depends on Dame Sow to start them on high protein sow's milk, and when they are weaned, he tries to mix a substitute of milk and by-products, high in protein, to build a big hog. Indeed, he starts this before they are born. He feeds this great essential, protein, before their birth, for he knows the mother's system demands it, and he feeds it after that her milk may be rich with it, and he knows that sows that are deprived of protein, have such a great craving for it, that they often will eat their pigs without any compunction of conscience. After the hog raiser has built a big hog skeleton and covered it with muscle and meat, and butchering time approaches, then he begins to throw in corn, the great grease-maker to cover that hog with a thick layer of lard.

Now, if a farmer can't build a hog out of corn, why does he try it with the turkey? Look over the list of farmers' wives who are confirmed turkey pessimists, and you will find the vast majority of them mixed up a batch of cornmeal and slapped it down before Mother Turkey's coop, and there it soured in the sun. This was flavored with red-hot pepper,—a remarkable concoction for brand-new babies.

For feeding little turkeys, first select the right feed and then handle it with care. You must not just feed, but feed to build. You must select a ration strong in ash, to make bone, and strong in protein to make blood, muscle and organs, for this is a natural turkey grower, and the turkey is a big bird, the giant of the turkey tribe.

FEEDING TURKEY POULTS. (See Fig. 9.)

Let the poults sleep and keep warm for thirty or forty hours after the hatch. That gives them time to digest and assimilate the egg

yolk which they draw into themselves shortly before they come from the shell. Don't start them on hard-boiled egg. It is too rich and indigestible for a new-born babe, and besides a little turk is full of egg when it hatches, and is nothing but an egg walking around on legs, anyhow. Aim at variety, and watch Mother Turkey's style of feeding.

The lousy, scabby-legged cluck is a gormandizer, and her plan of feeding turkeys is to stuff them to death. But Mother Turkey hands them a mosquito here, a gnat there, a June bug from away across the field, and expects several of them to make a meal off a single grasshopper. Mother Turkey's advice to the turkey raiser, and it ought to be framed: **FEED LITTLE BUT OFTEN.**

Thousands of little turkeys are fed to death. The little birds are so cute; they squeal like little pigs and chase the farmer's wife around and make her believe they are starving to death, and she pities them and feeds them a little more, and soon they stand around sleepy, with ruffled feathers; they drag their feed, drop yellow excrement, and then off they fly to turkey heaven.

Select the right feed, handle it with care, and feed little but often.

Oats is our best-balanced grain between carbo-hydrates and protein, and is rich in ash, the bone-builder. Feed dry. Steel-cut pin-head oatmeal is a fine turkey-starter, and hulled oats and chipped oats as they grow older. Don't substitute rolled oats for oatmeal; it causes intestinal troubles. After waiting for the yolks to digest, throw them a little oatmeal and fine grit the first two feed days. The third feed day give them fresh cottage cheese and dry sweet bread-crumbs, equal parts. The fourth feed day, give them dry sweet bread, dipped in milk and squeezed almost dry, for breakfast, oatmeal for dinner, and equal parts cottage cheese, bread-crumbs and fine chopped lettuce for supper, and a little oatmeal between meals, but never fill them up. The fifth day, broil an egg, and add equal parts bread-crumbs and fine-chopped tender onion tops for breakfast; one egg to every eight poults. For dinner feed oatmeal; for supper take equal parts cottage cheese, bread-crumbs, and fine-chopped tender dandelions, and oatmeal between meals. The dandelions is a fine tonic, and the onion tones the liver, disinfects the digestive tract, and kills the intestinal parasites to which turkeys are much subject.

This menu is not arbitrary, and much depends on the feeder's judgment and he must study his birds and handle them and feel their crops and decide much by the actions and condition of his birds. He must select the right food and then be careful not to feed too much of it at any time. Let oatmeal, old red wheat and hulled oats be the standby grains and give them sour milk often. The little birds need only be fed long enough to get a good start, and then Mother Turkey will take them out where natural turkey food abounds and do the rest. A light feed of red wheat at night, or bread dipped in sour milk will get them in the habit of coming home in the evening, and thus skunks, weasels, owls, and two-legged bird burglars will not have so good a chance at them and you will know how the birds are getting along.

TURKEY PESTS—LICE

Lice on turkeys are mostly found on head, neck, thighs, on wing-quills and the fluff. The fluff having highest temperature, is the louse

incubator, and poults and chicks, pull for the fluff to avoid being trampled, and there they get the big dose of bugs.

Head lice are worst, as they suck blood. The others eat skin, scruff and feather material, get on the nerves and rob fowl of sleep. Fowls fight lice with dust, this entering their breathing pores and smothering them, but some birds are negligent about their dust bath. Gobblers and roosters are too proud to get down in the dust, and for obvious reasons have more bugs than the hens. Turkeys have less lice than chickens, but sitters, being at a disadvantage, should always be dusted with a louse-killer; tender, helpless poults and chicks as well. Mother turkey should be dusted before you give her the eggs, ten days later, and the first day of the fourth week. This ought to catch all the old and new lice and bring her and the poults off clean of vermin. A very cheap, sure killer is made as follows:

Five pounds plaster paris.

One pint gasoline.

One-half pint crude carbolic acid.

Mix liquids, stir thoroughly into the plaster, screen over newspaper, let stand two hours and can for use. This is best for adult fowl; should be worked down to the skin, and the hen should be kept from the nest a few moments, as excitement and smell of powder may make her void. Not much powder is necessary and it will be found a number one disinfectant. Persian powder is best for poults and chicks. It is harmless, and if pure and fresh, knocks lice, fleas and many other insects dead. Turkey raisers should avoid grease, as it is apt to kill poults as well as lice.

GAPES

The gape-worm gets many poults and thousands of chicks each season. And old theory declares the gape-worm is hatched by the earth-worm. We leave this wiggler theory for our Government high-brow microbe hunters to wrangle over. We know that ground poisoned with chicken manure and soaked up with rain is a sure gape-worm hotbed. So to prevent gapes, simply keep chickens and turkeys on clean soil. Gape-worm remedies that are fed are gold bricks. The worm is not in the digestive tract, but in the windpipe, and what kills it must be breathed. The quickest and surest way to kill gapes is simply to get a small box and partition it to hold a brick on one side and a bunch of poults on the other. Have a lid with glass over the birds, so you may observe their actions during the process. Heat your brick; pour on it some carbolic acid, and when the poults have breathed enough of the vapor, taken them out, and watch them spit up the worms. This cure is sure.

TAPEWORM

The turkey is in particular subject to tape-worm, and these often kill birds almost ready for market. There are six now known species that affect poultry, the intestines being their particular feeding and breeding ground.

A tape-worm eggs does not hatch in the fowl. The eggs are dropped in excrement and then taken up by slugs, snails, worms and crust-

aneans, and in these their immediate host, they change to larvae, and are swallowed with their host by the fowls, in which they develop to an adult worm. Damp, filthy ground and foul pools are special promoters of these and other worms that infest poultry.

Symptoms are rather akin to tuberculosis. The victim eats heartily at first, then loses appetite, ruffles plumage, drops wings, stands solitary, has intense thirst, straddles legs, gets fits, voids frequently yellow, blood-streaked feces, and wastes away to death. Segments may be found in excrement, but a sure way is to diagnose is to slit intestine in water and worms will be found hanging there. All excrement should be destroyed, and houses and runs where affected flock frequent, should be thoroughly cleaned and disinfected.

An easy cure is to get the birds hungry and feed a mash fragrant with garlic or turpentine. This also kills the round worms and flukers that infest poultry.

To hit the spot quickly, use a rubber tube and pass a tablespoonful of turpentine mixed with the same amount of olive oil down into the crops of adult turkeys, and repeat next day, if necessary.

Deadly Turkey Blackhead (See Fig. 10)

The denaturalization of the turkey in a failure, and nature fake methods have so reduced the fowl's stamina that it has become prone to disease; the chief disease that is killing millions of turkeys annually, and threatens to exterminate the turkey tribe, is turkey blackhead.

The prevalence in this country is shown by the fact that but thirteen per cent. of our farms produce turkeys, and all of these but six have decreased in production.

Canada, Mexico and England are also swept by the plague.

Farmers call this disease "cholera" and while fowl cholera shows certain of its symptoms, there has not been an epidemic of fowl cholera in this country for fifty years. All poultry takes fowl cholera—even wild birds, but blackhead is restricted to turkeys and has two particular symptoms which proclaim its presence. The liver and caeca are always affected. The liver is greatly enlarged, gorged with blood, mushy, and covered with yellow and brownish spots, which are centres of diseases, deeply embedded and swarming with micro-organisms. The caeca are two pouch-like organs that spring from the union of the large and small intestines, and, as with the appendix in man, their function is not known, but it is supposed they simply afford more absorptive surface.

(See Fig. 11).

The blackhead microbe first attacks the caeca. They greatly enlarge, are plugged with yellow, cheesy matter, and yellow water, their walls greatly thicken, often break, and the surrounding membrane is inflamed and full of clotted blood. From the caeca, the germ is conveyed to the liver, and the disease follows a course from a day to three weeks in poults, and longer with adults, according to the stamina of the victim.

It attacks young and old turkeys, is especially prevalent in mid-summer, and when a victim begins to ruffle its feathers, drop its feet,

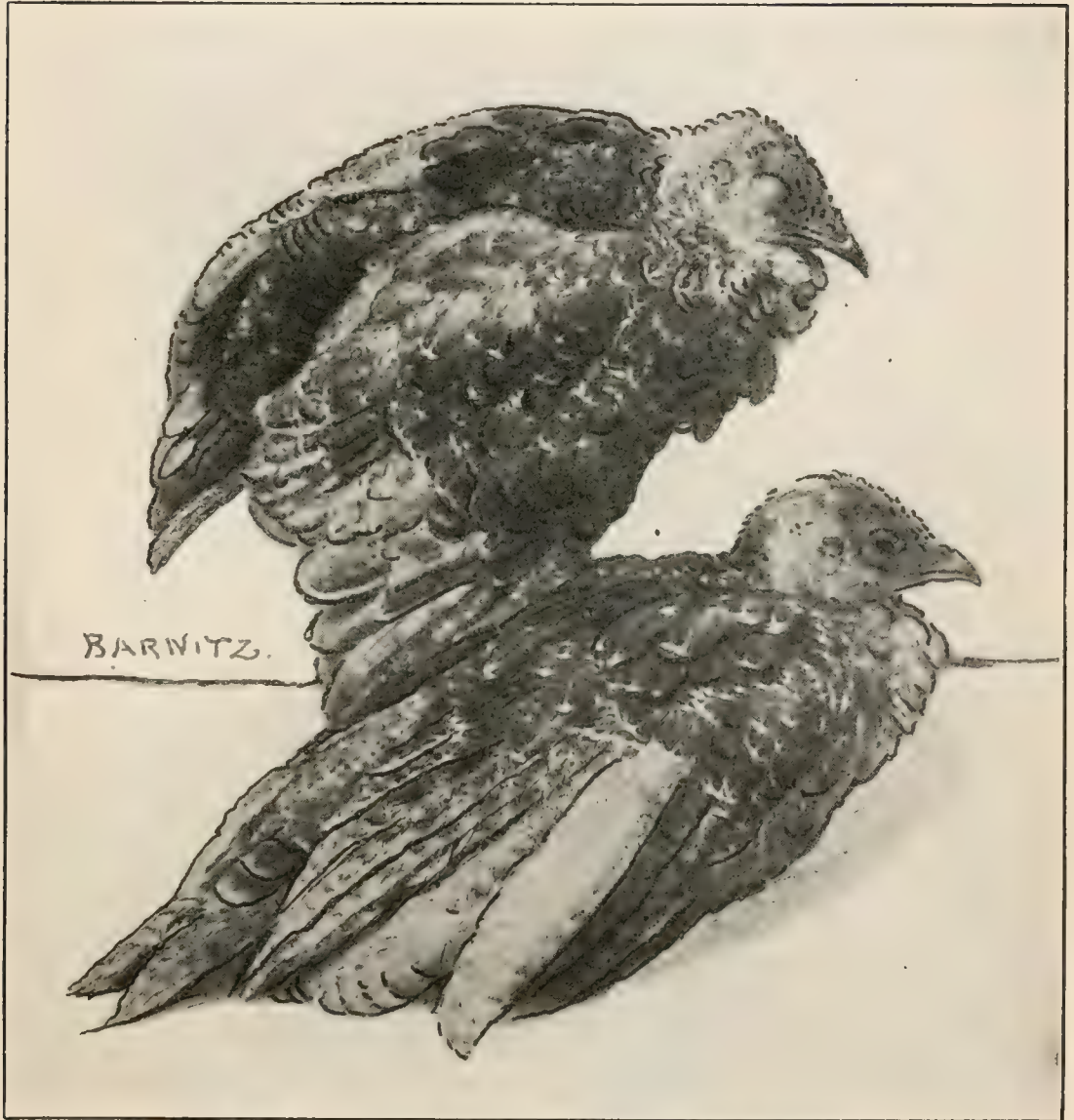


Fig. 10. Dying with Blackhead. Last Stage.



Fig. 11. Blackhead Caeca from Poult 10 Days Old.

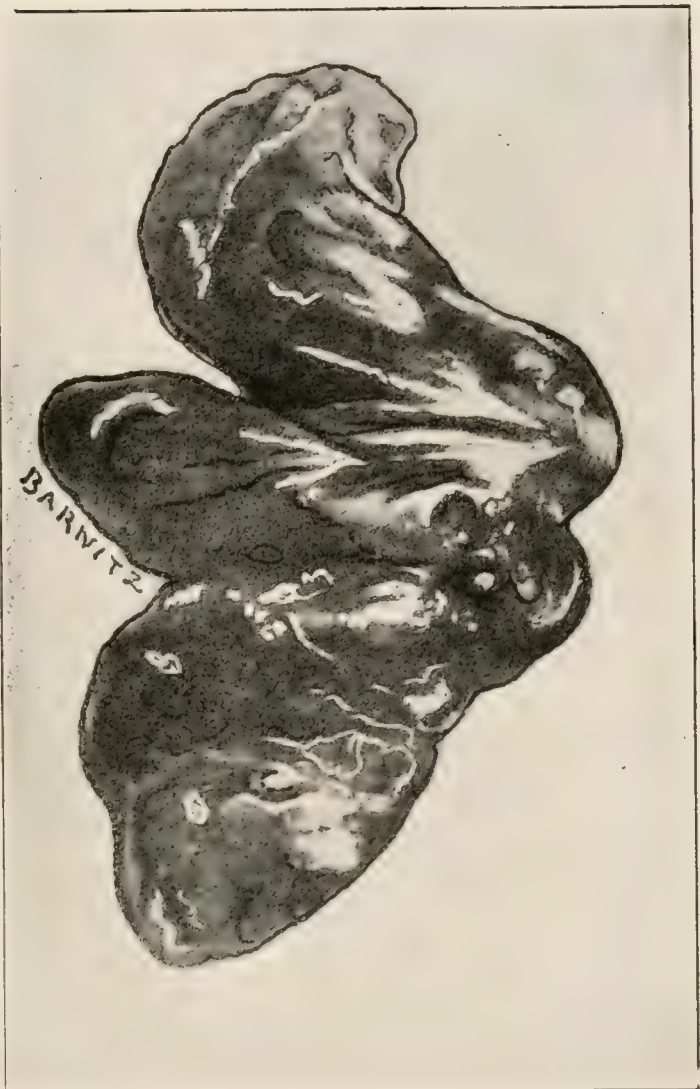


Fig. 12. The Blackhead Liver.

and drop that yellow, contagious excrement, an immediate post-mortem will show the liver and caeca beyond repair and treatment futile.

For ten years we have studied this disease among young and old turkeys. We have killed and opened them in what some would call the incipient stage, and we have allowed both old and young birds to linger along until at last they died. While the first were not so emaciated as the last, their livers, caeca and intestines had about collapsed, the crop, stomach and gizzard being in fair condition. (See Fig. 12).

Our conclusion is that there is no remedy but prevention for this deadly malady, for, while one may occasionally patch up an old turkey, the disease remains. The bird simply becomes a germ distributor and finally succumbs.

We are aware that the Rhode Island Experiment Station recently announced that sour milk is a sure cure for this disease. It may be they have a brand of sour milk peculiar to that state, of strange and wonderful curative qualities, for the Pennsylvania brand has been fed to turkeys for years and years, and still they perished.

It is not many years back that Rhode Island, after much experiment, declared the infusion of wild turkey blood, the turkey tribe's salvation. We believe that the turkey may be brought back to its early stamina and farm flocks flourish as of yore, by a return to natural methods, the Government co-operating with the turkey raisers, by conserving the wild turkey for their use, and likewise instructing them on natural methods with turkeys. The states have, with few exceptions, totally ignored the turkey raisers; but few agricultural colleges teach turkey culture, and we have yet to see a program for "Farmers' Week" anywhere, where turkey breeding was discussed.

Chickens compose ninety-five per cent. of this country's poultry population, turkeys, geese and ducks, composing the small remainder, and falling back in breeding because their production has been little encouraged by Experiment Stations, notwithstanding they are profitable and add to the food supply. Pennsylvania may bring back those grand flocks that once graced her farms and added to her revenue, by instructing her farmers on this subject, and by conserving the wild turkeys that still remain, for the infusion of new blood.

We hatch trout fry for the fishermen, to replenish the streams for their pleasure. Our great State is propagating tadpoles to promote the bullyrum business, and recently there was issued a very eloquent bulletin on "Conserve the Skunk." But are skunks and bullyrums more important than the delicious turkey? Should the hunter be allowed to kill any bird that is of service to the farmer, adds to the charm of the natural scene, or promotes the love of the beautiful in nature? Is it not more worthy, and the duty of this great State, to make it a crime, at any time to kill wild turkeys, and to establish wild turkey reservations, where this, the only species of poultry native to America, may be propagated for the distribution of wild blood and eggs, so that the perishing turkey tribe may be built up and the farms of Pennsylvania may again be graced with magnificent flocks, as of yore? We preach much on conservation; here is another fine opportunity to practice what we preach.

TRUCK FARMING: THE MAN, THE BUSINESS AND THE CROP

C. C. HULSART, *Matawan, N. J.*

I have often wondered why Mr. Martin placed me on this program. The only deduction I can make is that he had to have some one to fill in the period; but even then I cannot understand why he should select a Jerseyman who is located between the two great States of New York and Pennsylvania. It reminds me of a little story I heard of a teacher who asked a boy to define the word "sardine." The boy said: "Sardine is the meat between two pieces of stale bread which is called a sandwich"; and that is what New Jersey is—the meat between two pieces of stale bread. If it were not for New Jersey, the outside world would pretty near starve to death. I would not give thirty cents for the man who would not stick up for home.

I began farming thirty years ago down in Jersey where they can only farm one side of the ground; here in Pennsylvania you can farm both sides of your soil. Truck farming means good business ability as well as good crops. Most people think that any one can grow truck crops. In my section of the country I have seen a good many of them try it. About twenty years ago most everybody got the asparagus fever, and they all began to grow asparagus; instead of starting in on a small scale, most of them put out twelve, twenty, and even forty acres, and the first thing you know the potato bugs made their appearance in the potato fields, and the harvest came, and no one could look after the three things at once, and something had to suffer, and the people went back to their old style of farming.

The man who wants to go into truck farming must go into it on a small scale, and must handle on four or five or six acres the equivalent of the crops grown on forty acres in general farming. He wants to understand all the requirements of the crop he wants to grow, and their profits. In fact, I don't know of anything that requires a greater general knowledge both of crops, and of what are the market requirements for them, than truck farming. Several things are required of truck crops when they get to market; the first one of them is probably palatability; again, they must please the eye. Unless they are pleasing to the eye, the buyer will not be attracted to them, and after he has bought them for their pleasing appearance, unless they please the taste as well, he will have no market for them.

The first thing to find out is, whether your soil is adapted to the kind of crop you wish to grow, or not. In my section of country, there is a creek dividing the town; on the north side, the soil is a heavy clay loam; on the south side, it is a light clay loam, running partly to sandy. Now out of this has grown what is almost a tragedy. Men on the north side are trying to compete with men on the south side. The men on the north side grow large quantities, but it comes in a week or two later than the same thing grown by the men on the south side, and earliness is a prime requisite in market gardening. I can only compare truck farming to running for a train.

You have to start on schedule time. No matter how cold and inclement the weather is, or how late the frost, you must start in time, no matter whether you are going to use a greenhouse or a hotbed. On the first of March I was snowed in in Berks county, but when the proper time came the plants had to be transferred to the garden. When the proper time comes to gather the crop, Nature usually favors the man who got his plants out at the proper time, and the man who failed to do so is the man who says farming doesn't pay.

Two things the market gardener must bear in mind are: First, earliness; second, volume of crop. In a measure, it is practically impossible to get a maximum crop with extreme earliness. It is almost impossible because of the conditions. Nevertheless 60 per cent. to 75 per cent. of a maximum crop will pay the farmer better in the long run than 100 per cent. to 115 per cent. crop later on. Take tomatoes, for instance. The first tomatoes in the market usually run \$4.50, then \$3.50, \$2.50, and finally come down to 75c or 50c, and you can readily realize that when a fellow is two weeks behind, he cannot get the price. I went through my early tomato field the day before I started for here. The object of the tomato grower is to get them into full bloom before they get into pollen; if you set them out before that, the blossoms will fall off. More than half of these plants have on two, three, four or five little tomatoes. Now that plant is loaded for work, and the fertilizer can be handled altogether different from what it would be provided there is no fruit there. Now, if there were no fruit there, and the farmer gave it a liberal application of soluble plant food, it would go into leaf and vine, and it would be some weeks before it would come to fruit. When the fruit is on the vine, the plant is trying to do double duty, and we can afford to put on fertilizer quite liberally. Now we can begin to grow quantity so far as it is consistent with earliness.

The next thing we want is quantity, and with that we want sweetness, succulence, palatability. The only way you can get that is by feeding. Yesterday morning I was very much interested in hearing about soil fertility, and I can subscribe to everything that was said, and I am going to put this much emphasis on one of the points that was used. We can use all the manure that the farmers of Pennsylvania can get right on our green crops, and then make a failure unless we have water. Ninety per cent.—yes, 98 per cent. of the crops we grow—tomatoes, cucumbers, onions, etc., are all water; and we are only giving two tons of dry matter to a ton of water in strawberries. But you take a good, clean, pretty berry and put it where the passerby can see it, and nine times out of ten he will halt and look at it, and once he halts to look at that box of berries, he is lost, and he buys it and takes it home; it appeals to his eye; but if the sweetness is not there, you will have hard work to sell him again. With the cantaloupe it is somewhat different. He cuts in it with his knife, and if the palatability—the flavor is not there, he will not buy it. There is nothing to attract the eye, in the first place. When you go to market you have to have palatability—eating quality, and that can only be gotten by feeding, and sunshine. What is the reason that Rocky Ford, Colorado, grows a better cantaloupe than we can grow in New Jersey? It is because they have ten days of sunshine in a week, while we have only three or four. You fellows are laughing, but that sunshine out there does not belong to the

Union—it works overtime. The only way we can make succulence and palatability is through sunshine, and when we make plenty of leaf surface to catch that sunshine, then we are reaching out in the right direction. First, get pure bred seeds, and then feed them all along the line.

The man who starts out thinking he will feed his crop with compost, is about as successful as a man who will tie a peck of oats to the hind leg of a horse and then expect him to get fat. Every little rootlet draws up sustenance. Where does it get it? Right there on the ground. I remember when men used to dig up their manure, and then dig a little hole, fill it up and cover it and then expect the plant to thrive on it, without loosening the edges. There is many a farmer in New Jersey and Pennsylvania today who is doing just as his father or grandfather did. Now every particle of soil has some food in it, and it must be broken up so that these little rootlets can get it. The way to get this plant food into tomatoes and cantaloupes, etc., is by a side dressing. I am a nitrate of soda crank, because it has carried me through life for nigh three score years. I was one of the first men who used nitrate of soda. I have made some mistakes, and most of them have been on this basis. Most men make mistakes at times; it is through them that we get our experience. Some of us go on the principle that if a teaspoonful of medicine every three hours will cure you, three teaspoonfuls an hour ought to do it sooner, but it sometimes kills, instead of cures. Nitrate of soda gives us increased vegetation, but too much vegetation is injurious to the product of the plant. What you want is to get enough nitrate of soda to start the plant growth, and then let the fruit develop.

Now, to make my proposition clear, I want to say that the market gardener realizes that he must be in the market early; so he starts in with nitrate of soda and gets the plant tangoing all over itself, when all that plant needed was soluble plant food. The result is that the farmer is three or four weeks late with his fruit. All his growth has gone to vegetation. He should have given it a light dose of nitrate of soda, and started it growing, and then if necessary, given it another light dose or two. But the farmer says, "That is so much work; I want to do it at once, and get through with it." But that does not work in market garden crops. Last March I put a little nitrate of soda on my plants. I found little tomatoes on them and knew that the plant had something else to do than to form vine, so I put on nitrate of soda, about a hundred and fifty pounds to the acre. I am increasing that now to two hundred pounds.

We must not only get the fruit to grow, but we must get it to ripen, so to ripen it we put on soluble phosphoric acid; that will ripen it. I know that to be true from experiment after experiment. Now there was a discussion here yesterday morning as to the merits of floats and acid phosphate. I am an acid phosphate man, first, last and all the time, because we have soluble plant food from the moment we apply it, but when we apply floats, we have to make it soluble first. Now you apply phosphoric acid, six, eight hundred or half a ton to the acre, and with reasonable care such as the market gardener gives his plants, I will guarantee that your fruits will ripen regardless of the weather.

Let me give you a little incident that happened eighteen or twenty years ago. I had a field that I considered a pretty good one, but I got three hundred pounds of nitrate of soda and some acid phosphate and get some six or eight hundred pounds drilled into the ground and harrowed, and was late in getting my produce to market. I have learned since that acid phosphate is not to be applied except in small quantities, just as you would take medicine a teaspoonful at a time. Don't give your soil more than it can take care of at one time.

When you get me on this subject I am liable to talk too long. I have the reputation in Jersey of having talked at least one man to death. I don't want to do that here. But just one word on marketing. We market in New York. A man who starts in the business of market gardening, at first find whether he has a profitable market for his produce.

FARMERS' INSTITUTE SESSION

ADDRESS

By A. L. MARTIN, *Director*.

Now, my friends, you will notice that the remaining sessions of this meeting are devoted to the interests of the Farmers' Institutes of the State and the Advisers' Bureau. I will not take time now for any continued remarks, but will simply say that our Institute work this year has, to some extent at least, progressed. So far as attendance, at least, is concerned, it has been the banner year. We have spent about twenty-two thousand dollars on the work this year, and have had Institutes in every one of the 67 counties of the State. The attendance was over 208,000, and I think we are safe in saying that the work has been appreciated. When we take into consideration, further, that the interest manifested in these meetings has exceeded anything in previous years—and I am in position to know, after having been in the work of directing these Institutes for sixteen years—we can but realize what a hold agriculture has taken, and the necessity of carrying to the farmers of Pennsylvania the most approved methods of doing this great work as we find it today. We take fresh courage when we see the appreciation and the welcome extended to us in this great work by the farmers of Pennsylvania.

I remember sixteen years ago it required courage, and some diplomacy and the greatest amount of tact to get permission to hold a Farmers' Institute in some of the counties not very far from here. Today there are over a thousand applications for Institutes that cannot be filled. Why? Not because we have not the men and women who would be willing to go out into the counties all over the State, but because we have not the money to carry this work for-

ward at the pace that is demanded. It is impossible to hold three or four or ten Institutes in one county on twenty-two thousand dollars a year. Don't you see it? I believe that some of your County Chairmen say, "I believe that Martin is a stingy old fellow; why can't he be liberal with us, and give us the Institutes the people want?" But that is where you make the mistake, for Martin would like to give you all more of the these Institutes, but he is handicapped by lack of funds. Perhaps our next Legislature will be a little more generous with us along this line. Our last Legislature, and the Legislature in the past, have been exceedingly kind to us, but there are so many other calls for help in Pennsylvania that this great Institute work must divide with.

The last Legislature was kind to us. We received not only forty-five thousand dollars for two years' Institute work, but they considered another and far-reaching question—that of the Farm Advisers. After a thorough consideration of this question, they appropriated an additional forty thousand dollars and provided for the employment of ten advisers, whose work it is to visit the farms of Pennsylvania and give to the farmer the counsel and advice he needs to work out his own individual problem, and the best methods to be adopted on that particular farm. These ten advisers were divided into different sections—two to advise on soil fertility and and crop rotation. If there is anything that is of greater importance in Pennsylvania than any other thing, it is crop rotation. That does not apply to the single farmer or market gardener, but to the general farmer. Then two other advisers were appointed for one of the greatest of Pennsylvania's industries—livestock and animal husbandry. And then, again, another great interest in Pennsylvania, and one that is causing our neighboring states to stand up and look over the fence into Pennsylvania,—the poultry interest. I am not going to talk about this in detail, but simply point to the poultry interest as a unit—as one of the interests that makes Pennsylvania stand out as one of the great poultry states of the Union. These advisers are always busy men. Then we have another line, about which Mr. Hulsart talked to us so interesting and instructively this morning—market gardening and fruits. One man has charge of that work, and another has charge of another important problem to the farmers of Pennsylvania—farm drainage and water supply. The importance of this was shown when the soil was discussed yesterday. There are hundreds of acres which, if properly drained, would add much to the farm land and become a source of income to the farmer. The man who has charge of this work is a practical surveyor and engineer, who is also a farmer, and knows what is required of a proper system of drainage for the farm. And then, in line with this, and of equal importance, is the question of household sanitation; this includes everything that is included in the farm home, and is in charge of a lady well equipped for the work, whose duty it is to go out into the different homes of the Pennsylvania farmers, and there help the women of those homes to work out their own individual problems relative to the life on these farms.

There is at present before the people of Pennsylvania, and of the entire country as well, a serious problem, arising out of the high cost of living. Out of that condition has come the necessity for co-operation in farming, and in marketing the products of the farm. Can you

have a problem that appeals so entirely to all classes? When the farmers of Pennsylvania learn, as learn they will in the various schools of Pennsylvania, they will learn to work together and to grow the crops best adapted to their soil and climatic conditions and the market demands of the nearby cities of this great Commonwealth of Pennsylvania, then we will have near these great market centres storage places where the farmers of Pennsylvania may take their products and have them properly marketed. To this end we have also an adviser whose duty it is to look after the possibility of co-operation in the various communities.

During the five months that this Bureau has been in existence, these Advisers have made 2,555 visits to the farms of Pennsylvania; they have been busy giving advice and counsel to these 2,555 farmers on the individual problems that confronted them. The lady engaged as Adviser in Economics has been called on by home clubs and civic clubs, by private homes and schools. This lady, Mrs. Foulke, has prepared a circular on "Water Supply and Drainage in the Farm Home," copies of which are now here for distribution. You will all want one.

My friends, I have already talked too long, but my heart is full of this work, and the farmers of Pennsylvania have given me, and the Department of Agriculture new vigor and courage in the work by their hearty co-operation. Now, my friends, the discussion is open, and let every one ask questions and take part in this short Institute for the benefit of the Institute workers and Farm Advisers.

ADDRESS OF MISS LIPPINCOTT

Mr. Ball usually does the talking at meetings of this kind, but he is unable to be here. I was very much interested in what Mr. Martin said regarding the proper marketing of the produce of the farmer. When I took this position last June under Director Cooke, he said he would be very thankful if I could do one thing, and that is, try to cut down the cost of living. That is a big program. The first thing I had referred over to me was the supervision of the markets of Philadelphia. The two municipal markets need attention; they are not anything to be proud of, but until councils give us money to do something, I fear we will have to be satisfied. The next thing was the establishment of markets in the suburbs.

What I am trying to do now is to establish a market in the suburbs to which the farmer can ship his produce direct without the intervention of a middleman, excepting railroad or transportation facilities. You cannot get away from that unless you are within driving distance. And that is what I am working for at present—to reduce the transportation of produce to the city. My idea is that the farmer put his produce on the trolley car and ship it into the city, and then have a proper person sell it for him. The farmer can-

not be a specialist in selling and also in producing, and my idea is for him to employ a person at a living salary, and as a further inducement or bait, add a commission. I have in mind a place of twelve stalls, and as soon as I can get the farmers to send in their stuff there, it will be established. It is in a thickly settled part of the community, and it is not a municipal building, so we will not have to ask councils for the money. When I get several farmers to try out this experiment—for it is an experiment, and we do not know how it will work out—but when ten or twelve farmers come to me and express their willingness to co-operate, we will establish this municipal market. If it succeeds others will be established. If you are willing to come in and try it and put up with the hard times an experiment always calls for, it will be the beginning of the solution of the market problem.

Another thing will be the use of the parcel post. Now that is not any more of a solution than the other, but it is a beginning. In the recent move of the Postoffice Department regarding the distribution of produce through the parcel post, Philadelphia was left out. I was sorry at first, but I am rather glad, because I will be willing to play the part of the postmaster has to take the other way, and I will take more interest in seeing you are protected than he probably would. Now I am willing to take the names of farmers who are willing to ship by parcel post, and to give them the names of people, who so far as I know, are thoroughly reliable.

Mr. Anderson has kindly made mention of this in his paper, the "Pennsylvania Farmer," and I hope the farmers will come forward and show that they are willing to co-operate with this new municipal market and make a success of it.

THE RELATION OF THE GRANGE TO THE FARMERS' INSTITUTE

By E. B. DORSETT

THE GRANGE AS AN ORGANIZATION

In order that we may have a better understanding of the objects and principles of the Grange, it becomes necessary to relate some of its early history. Like all organizations that have moved the people of a state or a nation, or performed a work that has brought untold blessings to mankind, it has a history. It did not come into existence by chance, nor did it spring up, as a mushroom, over night; but it came as a ray of sunshine out of the darkened clouds that hung over this country during the Civil War. It came at a time when industry was paralyzed, our fields laid waste, our buildings burned or destroyed, and agriculture was at a low ebb. It came as though inspired of God and guided by His Providence.

When the last scene of that great drama of the Civil War was being enacted, something happened which led to the organization of the Grange. When the terms of peace were being carried out, Grant stood at the head of the Army of the Potomac, and Lee at the head of the Army of the South. According to the terms of peace, all the munitions of war, were to go to Grant, the victor. Everything had been carried out to the letter, except the distribution of the horses. When these were reached, Grant hesitated a moment, then, turning to Lee, said: "Tell the men they may keep their horses; they will need them in their spring's work." Out of the sentiment expressed in those words, grew the Grange.

After the armies had disbanded, and the men had returned to the places they once called home, President Johnson began his great work of Reconstruction of the States. During four years of strife, feelings of the bitterest enmity had been engendered. Often brother had been arrayed against brother, father against son, and now that the war was over, the bitterness and enmity remained. President Johnson soon saw that if he was to make this one country, one in which but one flag, and that "Old Glory" should be recognized, he must do something to bring those "Boys in Blue" and the "Boys in Gray" into a closer brotherhood. With this thought in mind, he called into his office a young man, employed by the Commissioner of Agriculture, by the name of O. H. Kelley, and informed him that he had been commissioned to go into the South and study agricultural conditions. He was instructed to visit the farms, the homes, and make careful note of what he saw, and report the same at Washington.

In obedience to his instructions, he was traveling along a Southern road one morning when he came to a beautiful farm house, one that had escaped the ravages of war. In the yard in front of the house was a typical specimen of Southern manhood. He was so impressed by the imposing structure of the building and the manly appearance of the man in the yard in front of the building, that he approached the gate and said "Good morning, sir." The man looked up and saw at once that his visitor was from the North and turned his head and refused to return the salutation. The young man was determined to know the reason, so he pressed still farther forward and said, "Sir, do you mind telling me why you refuse to speak to me?" Again the man looked up and said, "Certainly not; my father was killed by a Northerner and I made a solemn vow to God that no Northerner should ever cross my threshold." He then glanced at a charm that hung from the watch chain of the young man. On the charm he saw an emblem which instantly brought to his mind a certain pledge that both had taken, though separated by many, many miles. He hesitated a moment, then approaching the gate, swung it wide open, and extending his hand said, "Come in and welcome, brother." Then and there, at the little farm yard in the sunny South-land, the Grange was born.

Time and space will not permit me to give a complete history of the Order under discussion. Suffice it to say that its cornerstone is fraternity. Its object is to develop a higher type of manhood and womanhood among ourselves. Its principles are heaven-born—as broad as the universe, as high as the heavens, and as deep as the ocean. It is non-sectarian, non-political, and seeks the greatest good

to the greatest number. Such, in brief, is the history and character of the order, whose relationship with the Farmers' Institute I am asked to define: "Education of the Farmer One of the Chief Objects of the Grange."

The Grange being a farmers' organization, it has always been interested in the education of the farmer, and more especially in that which pertains to agriculture. Since the organization of the Grange, more real progress has been made in agricultural development than had been made during a period of two hundred and fifty years preceding its birth. In many localities high schools have been established, and a better system of common schools has been fostered, while within the Order, a knowledge has been imparted that has gained for the farmer a prominence that was heretofore unknown. Men have been fitted in the Grange for the platform, the press, the Assembly, for Congress and for statesmen. The Grange has become the Farmers' High School, his college, and his university, as it gives strength and culture to those who were not able to secure it elsewhere.

NATIONAL DEPARTMENT OF AGRICULTURE ESTABLISHED

One of the first important acts of legislation secured through the influence of the Grange was the establishment of a National Department of Agriculture, to be presided over by a Cabinet officer, known as the Secretary of Agriculture. The first resolution, introduced by M. D. Davies, of Kentucky, was passed at the session of the National Grange held at Chicago, Ill., in 1876, and reads as follows:

"Resolved, That American agriculturists demand that they shall be recognized as a real factor in this government by the establishment of a Bureau of Agriculture, to be presided over by a Cabinet officer, who shall organize the same on a plan to be devised by the wisdom of Congress, which shall embrace, to the fullest, the agricultural interests of 20,000,000 of the people, and whose counsel and advice shall have due weight according to the same, on matters affecting the agricultural people, and, also, our public affairs generally."

Similar resolutions were adopted by succeeding sessions of the National Grange, and committees were appointed to see that the desired legislation was enacted. Much opposition to the resolution soon developed in Congress, and the fight was a long and bitter one. The measure was opposed because it was said to be "Legislation for the protection of special interests." Others said "We have here the spectacle of a large class of people, already strong in material resources and abundantly able to protect their own interests, clamoring for the elevation of this department and for the dispensing of special favors to them. The request is not made by the real agriculturists of the country, nor by any relatively larger number of men engaged in that business throughout the land." It was called "an illegitimate child of the Government." In reply to this assertion, Congressman Hatch said, "If this department is an illegitimate child, then let the Forty-sixth Congress of the United States do the greatest act of its official life and legitimize this child of Agriculture. Illegitimate! If it be so, it has done more for the country than any other child born to it since the Declaration of Independ-

ence. It is the foundation of our wealth, the cornerstone of our prosperity, and the fruitful source from which we derive our richest and surest revenues." Time and space will not permit us to follow this measure through its entire career, but suffice it to say that after twelve years of determined opposition by its enemies in Congress, it became a law in 1889, and for the first time, Agriculture was recognized as a profession by our national government. I have narrated this bit of Grange history because of its close relationship to the subject under discussion.

About the time that the fight for national recognition of agricultural interests began in Congress, the Bureau of Farmers' Institutes was inaugurated in this State. This was due largely to the influence of the Grange, both State and National, which had awakened in the farmers, both in and out of the Grange, a desire for better agricultural methods and some practical instruction that would be of assistance to them in their farm operations. The Grange has been the pioneer in fostering agricultural education and in imparting instruction direct to the farmers. It has also been a potent factor in securing needed appropriations for Institute work, and for our own State College. Wherever it has shown its hand, its influence has been felt. No other organization has been as potential with the Legislature in securing legislation in the interest of agriculture, as the Grange. She leads, but never follows. Her motto is "Onward"; she never goes backward.

RELATIONSHIP DEFINED

While the Grange has no jurisdiction over the Farmers' Institute, nor no votes in its management, yet she wields an influence that is far-reaching. The relationship of the Grange to the Farmers' Institute is not unlike that of the Normal or Training School to the teacher. She recruits the ranks of the Institute Instructors as fast as they are needed. Look over the list of instructors engaged at present, and you will find that fully eighty per cent. of them belong to the Grange; and, if modesty did not prevent, I would add that the best of them, all belong. Go into the Grange halls scattered throughout the State, and there you will find young men and women discussing questions pertaining to the farm, the home, the school, the State and the Nation, in an earnest and intelligent manner. There these young people will get a training that will be invaluable to them when they go out into active service to tell others of their successes and their failures. They may not be able to express their thoughts with the same accurate grammatical construction, or give the same rhetorical expressions as the college trained man or woman, but they usually make themselves understood, and their message is generally accepted. Thus these two great agencies for public good have been, and are, working hand in hand for the general welfare of the people; each working toward the same end—that of creating a permanent Agriculture and establishing a higher type of citizenship in rural communities.

WORK OF THE INSTRUCTOR

The work of the Institute Instructor today consists not merely in imparting knowledge pertaining to agriculture, but must, of necessity consider all factors that enter into the various activities

of life. I know that this is contrary to the general belief of the people at large; as many there are who believe that all the Instructor has to do is to teach the farmer how to produce more to the acre. Increased production is one thing, and getting adequate returns for the thing produced, is quite another. Two factors which make for success or failure on the farm are the cost of production and the expense of distribution. It is of but little use to teach the farmer how to increase his production, improve his flocks, raise the standard of his herds and better the condition of his orchards, unless the additional time, labor and energy expended shall bring to him and his family increased comforts and happiness.

The problem for the instructor is how to raise the general level of the farmer and his family. In other words, we must attach more importance to the human side of agricultural progress, and this will have a profound effect upon the work of all the agencies for agricultural education. As home life on the farm is of greater importance to rural happiness and contentment than the production of crops and stock, it becomes necessary that we should teach more of those things having something of a human element in them; then the movement will gain in strength and favor. -The work of the Institute has been so divided that where two evening's sessions are held, one is to be devoted to the school, and the other to the home.

EDUCATIONAL NEEDS

At each educational session, questions pertaining to the school and the education of the farmer and his children, are taken up and discussed at length. Statistics show that out of every 500 rural boys and girls, only one ever enters an agricultural college. Only five in every one hundred rural and village children ever reach the high school. Furthermore, taking the entire number of boys and girls in the United States, only six per cent. ever go beyond the elementary schools. Hence ninety-four out of every one hundred boys and girls in the United States finish their education with the district school. This means that a large army of boys and girls leave the school each year at the tender age of fourteen. In order that the great army of boys and girls, who cannot go to our Agricultural College, might be reached, there grew up an insistent demand, emanating largely through the influence of the Grange and the Farmers' Institute, for the introduction of agricultural instruction in our rural schools, and the establishment of High Schools where such instruction might be pursued at greater length, thus keeping the boys and girls in school for a longer term of years. The recent acts of the Legislature pertaining to High Schools, Vocational Training, and Agricultural Schools or Departments, are the most far-reaching of any ever enacted. Pennsylvania now has a school system, and a set of school laws that cannot be surpassed by any state in the Union. Every school board in the State should take immediate steps to establish schools and courses in accordance with the provisions of the Act, thereby giving them benefits and privileges granted to but few boys and girls in the United States.

When all this has been done, when agriculture has been, and is being taught in all our rural and high schools, the work of the Institute Instructor will not cease, as this instruction must be carried

to the great mass of farmers in order that they may put into practice the most improved methods in farming. The work of the Farmers' Institute is a vast one, and its possibilities, and money needed to carry it on, are so great as to make the teaching of agriculture within our agricultural colleges almost insignificant in comparison, for we have several thousand men actually engaged in agricultural work on our farms for each boy that is being taught in our own State College.

THE HOME

No session of the Institute creates more interest or is productive of more good than the one pertaining to the home. The immortal Grady said, "The home is the strength of the American Republic." It is important then that more attention should be given to the home, and all that pertains to the home. The home is the source of all that is good, and much that is bad. From the homes of today must come the men and women of tomorrow. Make the home life right and the church life and the school life will be right, and when these are right, any State or Nation has a citizenship of which it may justly feel proud.

CONCLUSION

The work of the Grange and the Institute in the past has been pleasant and harmonious and I trust that it will continue to be so in the future. While each has a specific work to do, yet the end sought and the results obtained, are in the main identical. I should like to see these two great forces for human betterment bound more closely together. I believe the time has come for a federation of all organizations that work to promote the human welfare. There should be no working at cross-purposes, nor pulling apart, but all should work hand in hand in building up strong agricultural communities and in establishing a permanent agriculture.

HOW CAN COUNTY AGRICULTURAL SOCIETIES BECOME MORE EFFECTIVE IN FURTHERING FARMERS' INSTITUTE WORK?

By PROF. FRANKLIN MENGES, *York, Pa.*

Pennsylvania is the oldest agricultural state in the Union, with the exception of, possibly, Virginia, and the oldest county, and county organization in the United States was organized in Pennsylvania in 1787, and if I am not very much mistaken, it was organized in the city of Philadelphia, and the members were Quakers. Now I do not know just what the association was; Mrs. Lyon can probably tell you. I have been unable to get very much of its early history, but it is the oldest county organization in the United States. The

next one that came in, I am not sure about, but suppose it was organized in Chester county sometime during 1840, and from that time on until the present time there have been organized throughout the various counties of the State, a large number of county and township agricultural societies. In 1852 the first Agricultural College was organized in Pennsylvania. State College was founded at that time. It became one of the first of a line of pioneer agricultural colleges in the nation, and during that decade more agricultural societies were organized than at any time during the previous history of the State. And now, my friends, I have come to my own time, and will tell you what has been done in that time.

In my own county of York, the first agricultural society was organized in 1854. The purpose was to encourage competition between the neighboring farmers. Now, I can't talk about 1854, but I know that my father was one of the competitors in a plowing contest conducted by the York County Agricultural Society. The man who could strike the straightest furrow was awarded a prize. There was quite a competition, and there was some mighty straight plowing done. They could beat me all to pieces, and I suppose the rest of you. There were a number of competitors, and the award was something to be proud of. I don't think my father got the first prize. He didn't; he got the second. There were some mighty straight furrows turned, and they did not have any stake to go by, either.

Then another thing they did was to bring their own country horses and run a country horse race. You and I might smile at that, but do you know, it put something into that community which has been building up to the present time. Now, gentlemen, where did this emanate? Why, from the farmers themselves. Down around the central and southern parts of the State—I am not so sure about the Northern part—there were organized the first agricultural societies. Mr. Rodgers could refer you to societies that have been in existence for forty years—

MR. RODGERS: Yes, and more.

PROF. MENGES: Yes, and more, and they have done a wonderful amount of good and have been successful. That competitive idea between the various farmers of the county, to produce the various kinds of crops and exhibit them at these various societies and organizations, is an excellent one. I am very sorry to say that there are a large number of them that have gone all to pieces, but do you know, my friends, that they did not begin to go to pieces until about 1886, when farm products became so cheap that emulation was not worth while. I believe I could bring up some people here who could testify to that statement, but I am not going to call on them. I am old enough to know some of that myself. Farm organizations did not begin to go to pieces until farm products became so cheap that emulation was not worth while. Some of these organizations owned very valuable property. I am not here to exalt York county, but do you know what the property of the York County Agricultural Society is worth today? A million dollars! Every acre is worth eight hundred dollars. I am not sure what the Allentown property is worth—

THE MOVABLE SCHOOL: WHAT TOPICS, AND HOW SAME CAN BE BEST DIVIDED TO MEET LOCAL CONDITIONS

DR. M. E. CONARD, *Westgrove, Pa.*

Ladies and Gentlemen: I didn't know I was to be called on to speak on this subject, and I hardly know just how to present it, although Mr. Weld and I have talked it over a great many times. I know that he had a better report formulated for presentation here, on such changes as might suggest themselves as being desirable, than I can give you. These schools have been in service for a number of years, and I think I am correct in saying that there is an increased demand for them. Am I right?

DIRECTOR MARTIN: Nearly double.

DR. CONARD: It seems to me that it is a better procedure to discuss special topics a little more thoroughly than can be done in the Institute. At a regular two day session of the Institute there are certain things that the community wants discussed—corn-growing, stock breeding, or some particular thing, and it seems impossible to completely cover the subject in the time allotted to it. If, however, a man from the Department of Horticulture could go on in advance and talk to them for two days, and then the dairyman follow for another two, these subjects, or any others that the community might want, in the same manner, could be discussed in detail. We sometimes find ourselves cast on dry land, where we cannot do much good, because the community is not interested in our particular subject. Is that so, Wittman?

MR. WITTMAN: No; I can't say that I find it so.

DR. CONARD: Well, perhaps that is not so in poultry, but it is so in dairying, and it seems almost impossible to create an interest in dairying where it is not a logical thing to discuss. We have felt, at times, that it might be advisable for the school crops to be divided, so that the dairy end of it could go into the dairy district, and another end of it into some other district in the same manner; or at least have the two follow each other up, so that there might be time to discuss the subject in detail, but we feel that it might be better to send each interest where they are called for. The subjects to be discussed would have to be regulated somewhat by the community. The dairy people might discuss butter-making or milk shipping, as to locality. If they were away from a railroad where they have no facilities for shipping their milk, it would be a mere matter of turning it into stock raising; where they have good shipping facilities, it would be more logical to discuss it from the milk shippers' standpoint. Each department could be conducted along the same end. I don't know; I think I would suggest, perhaps—Mr. Martin only spoke to me about two minutes ago, and I have not had time to get this thing in my mind yet—but it seems

to me that the production of beef might be taken up in the butter district, or where milk-producing does not interfere. There are sections where the people would like to ship their milk away, but it is too expensive, or it depends upon the women; in such communities beef production might be an advantage, and I suppose a good stockman could be placed on the list. Two days seems like a long time to devote to one subject, but when we get at it, it seems too short. We have sometimes discussed taking two days at one point, and then taking the other three days in another part of the same community and finish up.

FIELD EXPERIENCE AND SUGGESTIONS OF FARM ADVISERS

1. MR. McLAIN: Mr. Chairman, Ladies and Gentlemen: I want to say that I am the "rooky" of the bunch, to use the military vernacular. I was enlisted last August, and consider myself very awkward, indeed. During that time I have answered seventy-five calls, from the last of September to the beginning of April of this year. These calls have been of various kinds. The majority of them have been on the drainage question. That has covered probably sixty of the calls. I had also a number of calls inquiring as to the possibilities of water supply, seeing what could be done with the various cisterns on the place in the matter of getting a water supply from one of them to the house. Then the water courses on the farm, what could be done with them, and how to handle them. Then I have been called in on the question of water power. I think that will come in after while, because it will furnish the power for a dynamo and a pump. This morning I heard something new—irrigation.

In most cases I find, in my work, that the farmers are not prepared to go ahead with the work. They are calling me more to find out the possibilities of drainage, and how to do it, with the expectation of going ahead in a very short time and doing the actual work. It covers the various kinds of land—sometimes creek bottom land, sometimes hillside land, sometimes right on the top of the hill. This sounds ridiculous, but there are many places in Pennsylvania where you find swamps right on the top of the hill. They want to find out what good drainage will do, what it will cost them, what kind of drain to put in. That has been the scope of my calls.

My suggestion would be that every Institute lecturer, every County Chairman, and every one connected with agriculture should talk this in your neighborhood. That is the way to find out. It is a new thing, and they don't know what it means. They ask me "what are your duties?" and I explain to them that my duty is to look over the possibilities of drainage, and advise them what kind of a drain to put in and to make the necessary survey for them, and then they are ready to talk of their troubles. I usually advise a tile drain, be-

cause I think that is the best. Then they ask about machinery, and if it is to be expensive to them. Then I explain to them the advantages of a water supply, and what a sub-soil plow will do.

After this meeting is over, if any of you want any information about it, I will be glad to give it to you. This is a new department, and I want you to tell your people about it, and write to either Director Martin or me. I am always on tap.

2. DR. CONARD: My calls have covered a pretty wide range of occupation, I should say; all the way from planning a large dairy barn, for probably two hundred cows, together with silos, etc., and working plans for the same, down to where I traveled eighty miles and back again, to tell a man to turn his pigs out. They were not thriving, and came pretty near dying, and all they needed was to get out into the air and on the grass.

DIRECTOR MARTIN: Well, if you saved that herd of hogs, the time was not lost.

DR. CONARD: Yes; his wife was there, and she said she would see he did turn them out; but if that man had had just a little more sense, he would have known that much himself. His wife said she told him that was what they needed, but he would not turn them out.

I have been consulted about constructing silos, building barns, remodeling old barns, regarding the right kind of a sire for the herd; helping to select it; helping a man select a lot of heifers for the purpose of making baby beef, down to going into another state and buying a herd of cows for a man who wanted to start a herd. Now, while I have been busy—I want to be busy—I could have done more work than I have done. Some of these calls, it has been necessary to go back two or three times. At present I have a barn that I am looking after for a man who wants to put up and knows nothing at all about it. He is a dentist, and I have to plan and look after the whole thing for him. I am even going to make and mix the concrete for him.

I think that after while we will have a whole lot of business, and perhaps more of these calls than a man can well attend it.

3. MR. DORSETT: The three great factors that have been and are the most potential in promoting the welfare of the farmer, and making his farm operations more successful, and in adding comfort and modern conveniences to his home, are education, organization and co-operation. My work as Farm Adviser consists in promoting these three great agencies for the general welfare of the farmer.

Education is that which fully acquaints a man with his business; a preparation for complete living. It may be gotten from books, it may be obtained through actual experience in conducting farm operations, or it may be a combination of the two; but however it is obtained, the farmer must have it if he would get the best out of life and make the most of his opportunities.

Organization is a joining of forces; a getting together. As an individual the farmer is helpless; but joined together with his fellows he becomes a power for good in all that makes for his success and

happiness. Organization is the beginning of progress. It is that agency that has been most powerful in making this country what it is today. It is much easier for the Department of Agriculture to co-operate with an organization than with an individual. Organization thus becomes a necessity, and the farmer who refuses to associate with his fellows not only stands in the way of his own success, but becomes a stumbling block for other.

Co-operation is defined by Holyoke, as "The equitable division of profits with the worker, capitalist and consumer concerned in the undertaking." Co-operation means literally a working together, and in its widest sense would include nearly every act of man in buying, selling or producing to gain a livelihood. The farmer co-operates with the miller when he raises wheat, and the miller with the baker, when he makes the wheat into flour.

Government enterprise is often called "paternalism" to discredit it, but it is nothing of the kind. It is true co-operation. We, the people, manage certain things ourselves, for our own benefit. The co-operation is coercive because the co-operation of all is required; hence it must be under the control and management of the government.

That co-operation is destined to become an important factor and a recognized necessity in the agricultural, industrial and economic world, is the thought and belief of some of our most informed readers and thinkers. But the principal reason to suppose that co-operation most ultimately succeed is that it alone brings about such a union of labor and capital as to prevent perpetual industrial warfare, and that cannot forever be tolerated. It may be further said that it alone is compatible with the ultimate complete triumph of Christianity. Co-operation means Brotherhood, a working for and with one another, not against one another.

The fundamental object of co-operation is to change the present social and commercial system. It does not contemplate a time when everyone shall be enrolled in a productive association, but it does look forward to a future in which the dominant relation in industrial life shall not be that of master and servant, but that of fellow-worker. While co-operation seeks to make the material things in life, production, buying and selling, wholesome and honest, it does not stop there. Its object is to work out in practice the true relations between man and man, which can only be done by frank acknowledgement of the ground upon which human society is based; and that is, that we must be fellow-workers and not rivals. Brethren of one family, to whom, indeed, the great inheritance of this earth has been given, but only on condition that it shall be used and enjoyed in the spirit and according to the will of Him who created it.

My work includes the organization of Clubs, Unions and Granges, and in giving such assistance as I may be able, in co-operative production, buying and selling. I shall be pleased to give personal supervision whenever possible, and such other information as will be of assistance to the farmer.

4. MRS. FOULKE: My work brings me in contact with the women, and it is a very much more difficult thing than some of you imagine. It is not easy for one woman to start out and tell another

woman what to do, particularly about her own house and her own affairs. Women are not in the habit of taking advice from any other woman on how to conduct their own affairs. I am not trying to make myself out a martyr, though; I like the work; it appeals to me very strongly because of its immense possibilities—because it is so far-reaching—because the need is so great.

It was not so easy to start out; I had to make other women feel that I was really trying to help them; that I deeply sympathized with them; that I had had all their problems to face; that I was a woman, like themselves; that I had had a little child; had had a home; that I had been poor; that I had to work, and was still working, and that it was simply a case of two heads being better than one, and that a sympathetic heart went with it.

You would be surprised to know how these women answered this appeal. They confide to me all their trials; they ask my advice on all kinds of questions—not only household economics, but how to manage their husbands; how to take care of their children; I have had to introduce women to each other in the same neighborhood—home bodies, homesick, heartsick women, longing for friendliness. The women of the small towns are different from the country women; the country woman finds she is different from them; these must be brought together, because each has something that she can give the other. I have gone into Women's Clubs, and induced them to go out into the country and get the country women to join them; they need the diversion, and the stimulation that comes from a broader intellectual life than they get in their isolation; often the country woman may not be able to get to the club meeting because there is no conveyance ready to take her there; then the town woman can send her auto—and is generally willing to do so, if the matter is brought to her attention; otherwise it may not occur to her. Or perhaps the club can go out to the house of the country woman for a meeting, or that a few women from the neighborhood, where they can bring their sewing, or their babies, if necessary, can run in upon each other and spend a few hours, discussing the same things they were discussing at the club. They talked about "rural uplift"; now I tell you we don't want rural uplift from inside out; we want it from outside in. We want the town woman and the country woman to belong to the Federation of Clubs and to have a common sympathy and interest in common topics. I have talked to Community Clubs in four large cities. I have talked to civic clubs, and I have talked to the girls in colleges; I have talked to the Pomona Grange, and I have tried to impress this one thing on all of them—that they will all be better for going out and helping each other. If these women would only exchange confidence on their way of doing things, every one of them would receive new ideas, and this question of sanitation would soon be solved. I have tried to impress on these girls at the colleges and schools that they are only better than the others because they have received a better education to help others. I have talked to Normal Schools, and they are all going out to help some one else. I have talked to small classes in rural communities on Domestic Science, and have tried to send them out with this same idea of passing along the helping hand.

I have had husbands to appeal to me to get their wives the medical attention they needed and could not get in the country; have had

mothers appeal to me to get their children into hospitals; I have written several hundred letters and have some now awaiting reply. I have tried to put my whole force, my whole life into this work; its possibilities are unbounded, and its inspiration is absorbing.

I am trying to raise \$650 to pay off the mortgage on a farm in Chester county, so that they may keep their little home. I am raising funds for a tubercular patient, and for a children's hospital. I have women appeal to me to know how to take care of the baby's bottle and how to cure a smoky chimney. How to take care of a half-grown girl; how to manage their husbands (of course I can always tell them that). Appeals from women who are physically infirm and whose husbands love them dearly, but don't know how to help them. I cannot begin to tell you what I have done, nor the range of these appeals, but I want to go right straight on.

5. MR. FUNK: Fellow Institute Workers: As many of you know, I was brought up on a truck farm, and I thought I knew what a year's work was, but I have just found out. I worked harder these past few months than I ever did in my life; answered several hundred letters, made several hundred calls, worked all day, and often late at night. Although the work has been very hard, I have enjoyed it very much, and I hope I have done some good. My line, as you know, included both orchard and small fruits, and I have also done some greenhouse work. You people who do not travel over the State of Pennsylvania would be surprised at the great number of demands in the fruit business. Men get the fever, and stick a few trees in the ground, and then go and sit on the back porch to wait until the fruit ripens. They don't know the first thing about their trees; I often have to do their pruning for them to show them how to do it. I have done some Institute work along this line, but find that this new work is more satisfactory in every way. It brings you right on the ground, and it seems to me that the farmers of Pennsylvania must all come from Missouri, they don't want you to tell them; they want you to show them. It is a whole lot easier to go out into the orchard, and show a fellow how to prune his tree, than it is to tell him, and when I go into the orchard, I often find two, or three or four fellows there, who want to see how it is done, and I go ahead and show them.

Now, things have not always been satisfactory. Dr. Conard says they don't always take his advice, and they have not always taken mine. Suppose they got too busy; but when I came back, they were ashamed to go out into the orchard. In many cases I have done very well, but not in all cases. All things considered, I have done very well, and have done a great deal of work, and there is still a great deal to be done. Sometimes I can make two, or three, or even four calls in a single day, and in that way cover a lot of ground, which makes it very much safer. You can do a great deal more work without working any harder.

6. MR. KESTER: To state what I have been doing, and how many times I have been called in, or how many letters I have answered, would take up entirely too much time, so I will simply say that I have been exceedingly busy both in correspondence and per-

sonal work. It is a work that has many features—some of them serious, some of them amusing, some discouraging, some encouraging. For instance, the other day I had a letter from a man to whom I had given good advice in reference to putting out an alfalfa field; he said he was sorry to say he had not met with much success; he had followed the advice of his neighbor instead of mine. It is one of the things we are up against. Those who are engaged in this work of improving agriculture, should use every effort to interest the public in the success of the farmer. We should enlist every educational influence—State College, the County Institute, and every educational agency that can be secured.

I divide farmers into three classes; first, the prosperous farmers who are doing well. They are on the alert, and make use of every means to advance themselves. They take in every farmers' session at State College; subscribe for the farm papers, their names are on the bulletin list, and they read them when they come. They are doing well. They are getting information and using it, and I must admit that it is from men of this class that most of our calls have come. It is not letting any cat out of the bag to say this, but it is something to think about.

The second class is composed of the farmers who are holding their own, but are not making much headway. They don't acquire their knowledge at first hand; they are slow to take advantage of what is offered them, but after a little while they begin to look over the fence to see what their more progressive neighbor is doing, and then go and do likewise. They just about manage to hold their own; their sons and daughters leave home. The sons and daughters of the first class do not leave home; they stay at home and become farmers. This second class never read the farm papers, except possibly the story on the back page; they never have time to read the bulletins, and they make no headway.

Then there is a third class that is simply holding on. They are the ones who claim that farming does not pay, and they don't want their sons and daughters to become farmers. They are the grumblers, the people who have no time or inclination to take up with the means of an improved agriculture. I will not say how large a proportion of farmers consists of this class, nor how long it will survive. In agriculture, as in everything else, it is a case of the survival of the fittest.

Now, I am not a pessimist, and my experience for eight or nine years in agricultural work, is that the first class is constantly increasing every year, and that is what is forcing Pennsylvania ahead as an agricultural state. The second class advances into the first class, and the third class will either be moved up into the second class, or be forced out of business altogether.

How shall we increase the vigor of the second class, which is now passive? How shall we reach the third class, or is it worth while to try to reach them?

7. MR. KLINE: In my work as a poultryman I have been very well received by the farmers throughout the State, and I don't think there is a farmer in the State whom I visited that I can't go back to. I find we can reach a man far better in this way than we can

through Institute work. At Institutes we have men who complain to us about certain troubles, but when we get on the ground, we find it is quite different from what it has been represented to us, and we can give them direct help by getting on the ground. In many cases I have to get right down on the ground and help them. I don't hesitate to pull on overalls and go into the poultry house to help a man. I do it at home, and I see no reason why I should not get right into the poultry house to show a man how to keep out the lice. I find on these farms a whole lot of men who are given credit for knowing a whole lot more than they do. I think that many of our failures are due to people who don't know what they are about. And I also think the number of failures is not greater in proportion than in any other business. Many farmers are today making a good living out of poultry. It is a favor to me to go and hear a man, and give him all the assistance I possibly can, and show him how he may make a success of the business if he works. The poultry business is deceiving to some people. They think all they need to do is to buy a few chickens, throw a little feed, and bring in the money. They are the men that fail. At home in my own plant I have to work a good many hours a day. I am willing to go not only to the man who runs a large poultry farm, but to the man who is raising a few chickens in his back yard, because, after all, they are the people who need it most, and they often develop into large poultry farmers.

8. PROF. MENGES: Those of you who are acquainted with Pennsylvania know that we have about as many varieties and types of soil as any station the Union can have. Geologically, we begin with the lowest formation, the Potsdam Sandstone, and we go up and up and up, until we reach twelve hundred feet, or over, and reach the Volutia. I could enumerate the various strata from which we derive our soils, but I do not suppose you would know very much of them by the time I got through. Now, my friends, the soils of Pennsylvania differ just as much as the sources from which they are derived. The Potsdam Sandstone, from which the South Mountain soils are formed, is the first of what is called "Geological Formation, Number One." It is an entirely different sandstone from any other sandstone in the State of Pennsylvania. It has lime in it, and a considerable amount of potash. Going a step higher, we have the Medina, Oneida, Oriskany, which is the dividing line between the Silurian and the Upper Devonian Age, and finally, you come into the coal measure. You have this type of soil in Southeastern Pennsylvania, and I am of the opinion that it is the only good potato soil in the entire State of Pennsylvania. Some of you are raising potatoes on other types of soils, but you are not raising the potatoes you would raise on the Potsdam soil. Then you have the Cambrian Limestone; they have that in Lancaster county, and there you will find the dairyman and the corn farms. If you want to go into the dairy business, you ask Conard or Lighty to tell you about that; I can tell you some of the crops your type of soil should raise, and what type you have if I know what part of the State you are in. Now, Mr. Fenstermacher raises potatoes on Hudson River Shale. They are good potatoes, but you will probably buy your potatoes from Dr. Funk, who raises them in Potsdam soil.

9. MR. WITTMAN: Now, instead of talking about the work I have done, or the work I am going to do, I am going to do some work right here. I am going to ask this association to adopt a resolution that next Monday shall be "Rooster Day." The National Association of Poultrymen have fixed Saturday, June 6th, as the day on which all male chickens not absolutely required for breeding purposes, shall be killed, and I propose that we get just a little ahead of them in this State, and make next Monday the day. The reason why hundreds of thousands of eggs will be rendered unfit to eat in a short time, if this is not done, is because fertilization has begun. The Governor of the State of Missouri has officially declared Saturday, June 6, as "Rooster Day," and I move that we officially designate Monday, June 1, as "Rooster Day" in this State.

APPLES; STARTING THE YOUNG ORCHARD AND TREATMENT OF BEARING TREES

By SHELDON W. FUNK, *Boyertown, Pa.*

Mr. Chairman, Ladies and Gentlemen: It is good and hot enough this evening. Many of you people have heard me speak along this line, and I don't want to rehash things, so I am going to change my subject a little tonight, and have a little round table talk, instead of talking to you on the treatment of bearing trees, and tell you some of the things I found out in my experience as Farm Adviser. As I understand it, the purpose of this meeting is to compare notes and see what we have gained out of our experience as Farm Advisers. It seems to me that the horticultural people get along just a little bit better than the other fellows, although I really believe we all agree pretty well, and will agree still better as time goes on.

The average lecturer has said too much about the pleasure and profit of growing fruit, and not enough about the hard work, and yet there is a whole lot of hard work connected with it. As I go over the State of Pennsylvania, I find men who stick their trees in the ground, and then do nothing more. I think the Institute lecturer should dwell more upon the fact that there is a whole lot of hard work to be done by the man who wants to succeed. It is very easy to plant trees. I know of men who were planting so many as twelve thousand trees in a single year, and they don't have any experience at all. I know of men who are planting ten, fifteen, twenty or twenty-five acres as an experiment. That is a pretty big experiment, and one that is not likely to turn out profitably. Everywhere I have gone, I have found neglected orchards. There is not much work in planting trees but every year the work is tripled, and every year they fall behind, and every year we are getting more insects to fight. It is a whole lot harder to grow fruit today than twenty years ago. The Codling Moth, and the San Jose Scale, and a whole

lot of other pests have come since then. And all you fellows have been growing for quality; you all know that when you feed into a horse, you do so at the expense of vitality, and it is the same with a tree; when you feed for quality, you do so at the expense of vitality. And that is just what is the matter with the orchard.

The first thing in starting an orchard, is to select a proper location. That is one thing we have perhaps not properly impressed upon the men who go into the business. I was out looking at one orchard yesterday, set right down here in this valley, where it will not get the proper sun or air. When we start out, let us start out on a small scale, with a few trees, and then spread out. And the first thing we want to do is to set our trees just as far up the hillside as we can.

Next thing, how about the soil? Some of us know something about the soil, and some of us don't know very much. When a man calls for me to go out and see whether apples, or peaches or plums will grow in a certain place, I don't look at the soil; I look at an old tree. If I find an old apple or cherry tree doing well, I know the new trees will do well, and it is the same with the peaches.

HANDLING AND MARKETING APPLES

By F. H. FASSETT, *Meshoppen, Pa.*

Mr. Chairman, Ladies and Gentlemen: The subject assigned me is one of the most important that confronts the fruit grower today. I wish it was possible for me to give you a solution. I can only suggest some things that we may do to enable us to get more out of the dollar that the consumer pays for our product. We can grow them, but we seem to fall down when it comes to marketing them.

In handling apples, we should commence early in the season. The trees should be properly pruned, sprayed and fertilized. Thinning is another operation that is not practised as much as it ought to be. Growers who have properly thinned can see the advantage in this operation. We can secure more bushels of salable fruit, and the tendency of trees where thinning is practised, is to bear annual crops. Apples should be thinned to about four inches apart. This thinning should be done right after the June crop; the latter part of June and the fore part of July is the best time to thin.

The best time to pick apples is a question we do not all agree on. Some handlers claim that apples will keep better in cold storage, to be picked just before they mature. To pick at this time, it seems to me we lose too much. We lose in size, color and quality. When we sacrifice quality we are sacrificing one of the strongest points the East has over the Western grower. We believe that the apple should be fully matured—that is, hard ripe; that is, just before they com-

mence to mellow. I think they will keep better and be of much better quality. All the experiments that have been tried go to prove this.

We should so handle them that we may get them into our packages without any bruises; in other words, handle them as though they were eggs. There are some tender varieties that it will pay to use gloves to pick them with. We ought never to use any package to pick them in that is not rigid. One of the best is an oak-stave half-bushel basket, with a swing handle, and a hook on the handle to hang it on the ladder or on a limb. Apples should not be piled on the ground, because the ground will cause them to sweat and ripen up and we lose much of the keeping quality. A good way is to have a sorting table in the orchard. One of the best tables has a canvass top with no sharp corners to bruise the fruit. If we use a packing house, then the apples should be drawn at once to the packing shed, that we may pack them at once and get them into cold storage as soon as possible.

An experiment was tried in Adams county to determine the influence on the keeping qualities. Some were placed in cold storage twelve hours after picking; some thirty-six hours, and some one week after picking. It was found that the ones that only twelve hours had elapsed between the picking and storing, kept much better. The longer the time between picking and storing, the poorer they kept.

It looks as though all our fruit centers would have to have these cold storage plants, and by all means make them co-operative. If it pays companies to maintain cold storage, it will certainly pay the grocers. We want to eliminate as many profits on our products as possible.

The kind of packages that are best depends largely on the markets we cater to. If we seek a retail market, or the ultimate consumer, then we should use the smaller package. The box or paper carton would be best. The barrel seems to be the most logical package for our Eastern apples, with the possible exception of some of the tender varieties.

The grading of our fruit has more to do with the value of a crop than the package. We must learn to make all the fruit in a package uniform in size and free from all blemishes. We, in Pennsylvania, must get a little more honesty in our grading. Very little fruit in Pennsylvania is properly graded. Too often they are faced up with nice apples, and filled with culls. This condition exists not only in Pennsylvania, but all through the East, and until we learn to pack our fruit honestly and have them uniform all the way through the package, we will have to take the skim milk prices, and the Western grower will get the cream—not because they are not as high quality, but because the Western apples are uniform in packing. These apples vary only one quarter to one-half inch in size, while a barrel of Eastern apples runs from two and a half to four and a half inches in size. The Western apples have a brand or stamp on them that means just what it says, and a dealer never thinks of opening these boxes to see how they run, but simply looks at those marks and can guarantee them as marked. We, in the East, have failed in this, and we must establish a brand or stamp and then stand behind them

with a binding guarantee, and then we will be able to drop out western competition. We ought to spend some time in the markets in which we expect to sell, studying the conditions, and become acquainted with the man who handles apples, and study just what kind of packages sell the best. We can pick up many useful facts.

One of the things that keeps the price of apples down, is the placing on the market of poor, wormy apples, covered with fungus diseases, and unfit for food. We must learn to utilize them at home by working them up into applebutter, jelly, or in vinegar, whichever will pay us about as much, and the market for our good fruit will be much better, and more apples will be consumed.

In the West, Fruit Associations and Exchanges handle the bulk of the crop, and have been very successful; one of the reasons is that the apple production in the West is confined to small valleys, which has made it much easier to form these Associations. Our conditions are different, and it seems hard to get our Horticultural Societies to take hold of this marketing end. Our production is scattered all over this state; hardly a county but what has some large orchards. Few counties have a large section devoted exclusively to fruit like in the West, which makes it hard to get together. The fruit belt of Adams county comes nearest to Western conditions, and we have been looking for a number of years for our friends in the Adams County Horticultural Society to take hold of this marketing question. Why not? Bedford county formed a marketing association some years ago: just how successful, I do not know. The plan seems ideal and I believe the East must sooner or later adopt this plan. We must organize just a little closer and learn to co-operate together in order that we may get our share of the consumer's dollar. We have every advantage. We have the soil and climatic conditions whereby we may grow the very best apples in the whole world, and we are at the very doors of the best markets. We must give our marketing closer attention and we are bound to succeed.

MEMBERS

OF THE

Pennsylvania State Board of Agriculture

FOR THE YEAR 1915

MEMBERS EX-OFFICIO

- HON. MARTIN G. BRUMBAUGH, Governor.
- HON. HENRY HOUCK, Secretary of Internal Affairs.
- DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
- DR. EDWIN ERLE SPARKS, President of the State College.
- HON. A. W. POWELL, Auditor General.
- HON. N. B. CRITCHFIELD, Secretary of Agriculture.

APPOINTED BY THE GOVERNOR

- John H. Stephens, Esq., Johnstown, Cambria County,Term expires 1916
- Mrs. Jean Kane Foulke, West Chester, Chester County,.....Term expires 1917

APPOINTED BY THE PENNSYLVANIA STATE POULTRY SOCIETY

- W. Theo. Wittman,Allentown,.....1917

APPOINTED BY THE PENNSYLVANIA BEE-KEEPERS' ASSOCIATION

- E. A. Weimer,Lebanon,1918

ELECTED BY COUNTY AGRICULTURAL SOCIETIES

- Term expires.
- Adams,A. I. Weidner,Arendtsvile,1918
- Allegheny,C. L. Hood,Coraopolis, R. D.,1918
- Armstrong,S. S. Blyholder,Kelly Station,1917
- Beaver,Walter C. Dunlap,West Bridgewater,1917
- Bedford,Wm. F. Biddle,Everett,1918
- Berks,H. G. McGowan,Geiger's Mills,1916
- Blair,W. Frank Beck,Altoona,1917
- Bradford,F. D. Kerrick,Towanda,1916
- Bucks,B. Frank Wambold,Sellersville,1917
- Butler,Wm. H. Milliron,Euclid,1917
- Cambria,L. J. Bearer,Hastings,1916
- Cameron,R. P. Heilman,Emporium,1916
- Carbon,Edward Lienhard,Mauch Chunk,1917
- Centre, .. . John A. Woodward,Howard,1918

		Term expires
Chester,	M. E. Conard,	Westgrove,1918
Clarion,	J. H. Wilson,	Clarion,1916
Clearfield,	Harrison Straw,	Clearfield,1916
Clinton,	Joel A. Herr,	Millhall,1917
Columbia,	A. P. Young,	Millville,1916
Crawford,	W. F. Throop,	Espyville,1918
Cumberland,	Abram Bosler,	Carlisle,1916
Dauphin,	E. S. Keiper,	Middletown,1917
Delaware,	Thos. H. Wittkorn,	Media,1917
Elk,	John M. Wittman,	St. Marys,1916
Erie,	John J. Rouse,	Wattsburg,1916
Fayette,	John T. Smith,	Dunbar,1916
Forest,		
Franklin,	J. P. Young,	Marion,1917
Fulton,	Frank Ranck,	Hancock, Md,1916
Greene,	C. E. Lantz,	Carmichaels,1916
Huntingdon,	George G. Hutchison,	Warrior's Mark,1918
Indiana,	S. C. George,	West Lebanon,1916
Jefferson,	Peter B. Cowan,	Brookville,1916
Juniata,	Matthew Rodgers,	Mexico,1918
Lackawanna,	Horace Seamans,	Factoryville,1916
Lancaster,	J. Aldus Herr,	Lancaster,1917
Lawrence,	Sylvester Shaffer,	New Castle,1916
Lebanon,	H. C. Snavely,	Cleona,1916
Lehigh,	P. S. Fenstermacher,	Allentown,1918
Luzerne,	J. E. Hildebrant,	Dallas,1918
Lycoming,	A. J. Kahler,	Hughesville,1918
McKean,	E. A. Studholme,	Smethport,1916
Mercer,	W. C. Black,	Mercer,1917
Mifflin,	C. M. Smith,	Lewistown,1918
Monroe,	F. S. Brong,	Saylorsburg,1916
Montgomery,	John H. Schultz,	Norristown,1917
Montour,	J. Miles Derr,	Milton,1916
Northampton,	C. S. Messinger,	Tatamy,1918
Northumberland,	I. A. Eschbach,	Milton, R. D.,1916
Perry,	Clark M. Bower,	Blain,1916
Philadelphia,	David Rust,	Philadelphia,1916
Pike,	B. F. Killam,	Paupack,1918
Potter,		
Schuylkill,	John Shoener,	New Ringgold,1916
Snyder,		
Somerset,	Robert W. Lohr,	Boswell,1917
Sullivan,	G. Eugene Bown,	Forksville,1918
Susquehanna,	Frank A. Davies,	Montrose,1916
Tioga,	C. H. DeWitt,	Mansfield,1917
Union,	J. Newton Glover,	Vicksburg,1917
Venango,	Wm. A. Crawford,	Cooperstown,1916
Warren,	R. J. Weld,	Sugargrove,1917
Washington,	Jas. M. Paxton,	Houston,1917
Wayne,	W. E. Perham,	Varden,1917
Westmoreland,	W. F. Holtzer,	Greensburg,1916
Wyoming,	G. A. Benson,	Tunkhannock,1916
York,	Geo. F. Barnes,	Rossville,1917

OFFICERS

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Hon. Martin G. Brumbaugh,Harrisburg

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F. D. Kerrick,Towanda.
J. P. Young,Marion.
C. H. DeWitt,Mansfield.

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P. S. Fenstermacher,Allentown.
W. C. Black,Mercer.
G. F. Barnes,Rossville.
Hon. H. G. McGowan,Geiger's Mills.
C. M. Bower,Blain.
Matthew Rodgers,Mexico.
John Shoener,New Ringgold.
N. B. Critchfield, Secretary, Ex-officio,Harrisburg.

ADVISORY COMMITTEE, CONSULTING SPECIALISTS AND STANDING
COMMITTEES AS REPORTED BY THE EXECUTIVE COMMITTEE

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J. H. Schultz,Norristown.
Joel A. Herr,Millhall.
W. C. Black,Mercer.

LEGISLATIVE COMMITTEE

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Robert W. Lohr,Boswell.
S. S. Blyholder,Kelly Station.
P. S. Fenstermacher,Allentown.
Matthew Rodgers,Mexico.

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J. Aldus Herr,Lancaster.
Col. John A. Woodward,Howard.
B. F. Killam,Paupack
George G. Hutchison,Warrior's Mark.
W. C. Black,Mercer.

CONSULTING SPECIALISTS

Botanist,Prof. F. D. Kern,State College.
Pomologist,Chester J. Tyson,Floradale.
Chemist,Dr. William Frear,State College.
Vet. Surgeon,Dr. C. J. Marshall,Harrisburg.
Sanitarian,Dr. S. G. Dixon,Harrisburg.
Microscopist and Hygienist,.....Prof. J. W. Kellogg,Harrisburg.
Entomologist,Prof. H. A. Surface,Harrisburg.
Ornithologist,Dr. Joseph Kalbfus,Harrisburg.
Meteorologist,Prof. W. G. Owens,Lewisburg.
Apiarist,H. C. Klinger,Liverpool.
Economic Geologist,Prof. Baird Halberstadt,Pottsville.
Agricultural Geologist,W. H. Stout,Pinegrove.
Forests and Forestry,Irvin C. Williams,Harrisburg.
Feeding Stuffs,G. G. Hutchison,Warrior's Mark.
Soils and Crops,Prof. Franklin Menges,York.

STANDING COMMITTEES

CEREALS AND CEREAL CROPS

Edward Leinhard, Mauch Chunk.

ROADS AND ROAD LAWS

Col. J. A. Woodward,Howard.

FRUIT AND FRUIT CULTURE

E. A. Studholme, Smethport.

DAIRY AND DAIRY PRODUCTS

B. Frank Wambold, Sellersville.

FERTILIZERS

F. S. Brong, Saylorsburg.

WOOL AND TEXTILE FIBERS

S. C. George, West Lebanon.

LIVESTOCK

W. F. Throop, Espyville.

POULTRY

W. Theo. Wittman, Allentown.

PAPERS READ AND ADDRESSES DELIVERED AT
THE THIRTY-EIGHTH ANNUAL MEETING OF
THE PENNSYLVANIA STATE BOARD OF AGRI-
CULTURE, HELD AT HARRISBURG, PA., JANUARY
26, 27 AND 28, 1915.

REPORT OF COMMITTEE ON CEREALS AND CEREAL CROPS

By J. NEWTON GLOVER, *Chairman.*

The premature reports of the enormous crops for 1914 failed to materialize as fully as predicted by the authorities at Washington; though crops yields are 9% larger than last year, but nearly 8% under that of 1912. The continued wet weather in the spring delayed oats seedings, and it was followed by hot and dry weather which made spring crops less than first reports promised, yet more favorable weather later helped make a better yield by 2% than the ten year average. Prices for grain started lower than in 1913, but the war in Europe raised the price of wheat from 75 cents to \$1.30 in 5 months.

WHEAT

This crop was covered with snow a good part of the winter and looked well in the spring, making a good growth of straw later and filled well, giving an average yield for this State of 17 bushels, while the yield for the United States was 16.7 bushels, against 14.4 bushels as the 10 year average, showing the seasons have been more favorable, or that farmers are producing more per acre. Black rust did much damage in the spring wheat states, lowering the yields there, and the Hessian fly was responsible for some damage in our State. The average price for 1914 was 96.2 cents against 77 cents for 1913 crop, and the estimated yield is 891,950,000 bushels in all. On account of the increase in price due to the war, about one per cent. more acres were needed than ever in this State, but the dry weather in autumn and fear of damage by the Hessian fly, wheat seeding was delayed and the soil not as well prepared for seeding as usual. More acres of corn stalks were seeded to wheat than formerly, since more silos were filled with corn which left ground ready for disking and seeding to wheat on a seed bed favorable for a good wheat crop.

CORN

"Corn is king of crops," and receives more attention than any other crop, because of the many ways it can be used for food for man and beast. The crop was 2,672,804,000 bushels for the country, or an average of 25.8 bushels more per acre than last year, while 63.7 cents was the price on an average. Though our State stands 14th

in production of corn, yet the average yield is 39 bushels of shelled corn, which is higher than that of most of the great corn states. There was much soft corn in some sections of the State on heavy clay soils which had not been plowed in fall or early spring before the dry spell began where there was not enough moisture to germinate seed, and it did not grow till rains came in June. Greater care is being taken in selecting and testing seed corn to get an even stand, as advocated by the agricultural press and institute instructors. There are about 17,000 silos in this State, of which 17% were built last year, and farmers realize that this is one of the best ways to care for this crop for either beef or milk production or for a succulent feed for brood sows and chickens.

OATS

The oats crop of this country was 1,141,060,000, making an average of 29.7 bushels per acre or nearly the same as 1913, while the price was four cents more per bushel. While this crop is not always a profitable one in all section of the State, as so much depends upon the weather when it is filling, yet it fits into a four-year rotation nicely, and the crop can be removed in good time to prepare a good seed bed for wheat, or in some sections, grass follows it well where wheat is not grown largely.

RYE

This State ranks 4th in production of rye, with an average yield of 17 bushels per acre, and it is sold at an average price of 75 cents. The fact that it yields more straw and grain on thin soils than wheat and can be seeded later than wheat, is one reason why so many acres are grown and it makes a good cover crop in corn stalks which otherwise would lie bare. In the production of buckwheat, Pennsylvania ranks first, with an average yield of 18 bushels per acre, or a crop of 5,180,000 bushels. The yield of our State was 3 bushels lower than the average of the United States, due to the hot, dry weather when filling.

HAY

More acres are devoted to grass than any other crop in Pennsylvania which gives us second place in production of hay, or 4,146,000 tons. While the hay crop was not nearly so good as the 1913 crop, on account of dry weather during the growing season, yet the yield for the country was better by nearly one-tenth of a ton per acre and the price \$1.30 a ton less. On account of the continued dry weather during summer and autumn, pastures were short, and stock had to be fed dry feed earlier than usual. Very little clover seed was made, as the second growth of clover was short and not well filled. The hay crop having been cut short by dry weather, very little timothy was left for seed as compared with the previous year, though much seed was held over on account of lower prices for the 1913 crop.

POTATOES

In the production of this crop our State stands sixth, with an average yield of only 88 bushels per acre, and they sold for nearly 80 cents per bushel, while the average price for the country was

about 49 cents, and the yield 109½ bushels. Blight and beetles were not so much in evidence the past year as to make spraying so necessary as other years.

On the whole it was a good year for the American farmer, and the war in Europe made better prices possible than otherwise could have been realized, and it is a case of one nation's loss being another's gain. But the American farmer is learning to rotate his crops so as to get a legume or clover crop every few years, instead of following corn after corn or wheat after wheat, as they tried in the spring wheat states till their soils got so full of foul seeds that they had to change their rotation to get in a cultivated one to kill weed seeds.

One of the hopeful and encouraging signs of the times in agriculture is that more students are taking the agriculture courses in college and more business men are buying farms as a business proposition, while the average farmer is trying to grow crops more profitably, not because he wants to have more money to buy more land to grow more corn. But farmers want to make more money to enable them to have in their homes the comforts, conveniences and pleasures which will make them and their families better contented and happier on the farm, and to some extent stop this exodus of the best blood to town to enjoy some of the advantages there which farmers should try to have in their homes or in their neighborhood by working together as a community along that line for which their soil or section is best adapted.

ADDRESS OF GOVERNOR BRUMBAUGH

I am not, of course, in a position to discuss this as a presiding officer; but if you will allow me that courtesy for a minute, I should like to say a word or two as bearing upon it. My thought would be that any action now either favorable or unfavorable to the report of this Volunteer Committee would be unwise, just as I take it that any report by the trustees of State College this afternoon would be unwise. If I may make the suggestion, I would suggest notifying the trustees this afternoon that you have the committee of this body willing to confer with a committee of their body to work this problem out and in that way take the initial step for conference and not take an initial step of absolute declaration of your purpose. In other words, I think it is always good, brethren, to hear both sides of the case before you make up your mind as to the disposition thereof.

That is merely a suggestion in passing. If such a committee were designated here, it could carry this report or any other matter that would be presented here to the committee of the trustees of the college, and since you have exactly the same interests at heart that they have, surely you could get together in that way. That probably would be the most satisfactory to both of you and perhaps to

the best interests of agriculture at large. That is simply a suggestion in passing. Now I don't want you, dear brother, to make any motion on that.

Now I want to say something more if you will allowed me: First, I have an important series of conferences up on the Hill in a very few minutes and shall be obliged to vacate the Chair and ask the man who really ought to preside to come into his own; but before doing that I just want to say a word or two to you. In the first place, I should like you to read with considerable care what I said on Tuesday last on the subject of agriculture and make that, if you please, at some time during your session, the basis of some discussion here. If what I have said there is not the thing that ought to be said I trust you will be frank enough to tell me so, because I have no pride in the language and no pride in the thought expressed there whatever. What I honestly tried to do was to say to the people of Pennsylvania that the agricultural interests of this Commonwealth are so vital to its whole population that everything that the wisdom and the experience of our people could do should be brought to bear in the solving of the agricultural problems of Pennsylvania.

As you very well know, we have had a growth of agricultural interest. Legislature after Legislature has created department after department. I confess to you very frankly that I don't know what these different departments do. I don't know how many of them tramp on each other's toes. I don't know how many of them leave wide gaps of untouched service between their different functions. Perhaps you don't know, but this I know, that first of all we should make a clear demarkation between the teaching functions in agricultural administration and the purely administrative functions in agricultural education, and having drawn that line we should turn to each field of endeavor and organize it into a scientific and efficient service to the farmers of Pennsylvania. If there is a duplication of clerical effort to a conflict of clerical services, let us eliminate that. We are not here to create offices and to take care of a lot of political accidents. We are here to make the money from the Treasury of this Commonwealth reach back into the farm and bring a larger crop of food from the soil to the whole people of Pennsylvania. (Applause).

Now you see, therefore, that this thing requires at every step, the most careful, the most accurate, the most considerate attention on the part of all of you who, by law, have to do with this problem and see whether we cannot work out a program of efficient administration and efficient instruction that will actually meet in the largest way and at the least cost to the people, the interests that we all have at heart. Now you have heard one report read here; you will hear others. Do you think it is a satisfactory showing, good as it was, aside from one or two problems? We are getting about \$18 or \$20 for an acre of Pennsylvania soil. Is that a fair return? Count out of that the cost of living, the cost of production of that amount of foodstuff, and see what a pittance remains. I make the definite statement that it is easily within the reach of the people of this State to double the output of each acre in Pennsylvania in ten years if we want to do it. Now take your pencils and figure what it would mean to the farmers of Pennsylvania; what it would mean to the in-

dustries of Pennsylvania in the cheapness of the food of our toilers and in the enriching of those who produce the food back upon the soil.

My friend who recently came to this country from Belgium and traveled over it in a provisional capacity, pointed out that the thing that impressed him wherever he went was the terrible waste of our people. We throw away almost as much as we save of the products of our industry and the bounty of our soil. I was completely mad the other day when I saw a fellow selling apples from a huckster wagon with a half-bushel measure, all kinds of apples mixed up, as we Dutch would say, "verhuddled," until you did not know whether he was selling Northern Spies or Ben Davis or rotten apples or sound apples or good apples or bad apples. Of course he got nothing for them and he did not deserve anything, selling them in that way. I think we should begin with a study of the soil and follow that with a study of seed and follow that with a study of treatment of that soil for the reception of the seed and following that we should trace the growing crop until it reaches a point where it is fit for the market; then study the method of marketing and selling, tracing that thing out step by step and at each step, reducing the whole procedure to a scientific thing and you will find that instead of 35% of the market price of your food stuffs going back to the farm, 50% or 60% would go back to the farm. Why, next to the automobile business, the most extravagant business in America to-day, is the marketing of our farm crops. We are throwing away with the air of prodigals the very wealth that ought to go back in terms of better treatment and enrichment of our soil.

Now I was born on a farm, I am not talking to you from a textbook; I am talking to you from a hillside farm, which, at points, was so steep that when apples fell off the trees they alighted in the public road at the foot of the hill. I know something about this thing and I know what I am talking about for the central counties of Pennsylvania, and I wish you would make it, as a body here, a matter of scientific study and then those of us that are committed by you to the important task of organizing the service for the farmers ought to take these various activities and organizations that are working for the farm, and organize them into the largest and most economic service we can possibly have in Pennsylvania.

I want to say to you very frankly that I have in mind some treatment along that line of this problem and I want your co-operation and your considerate judgment upon the matter when once it is sufficiently matured to lay it in proper form before you. I am just glad to be here, to look into your faces for a minute, to sit in this Congress of important men and entrusted with a vastly important service, together with the one woman who belongs officially to your family, and to tell you that always and everywhere, every one of us from your Governor up, should stand absolutely steadfast for better treatment of the soil and better conditions on the farms of Pennsylvania. (Applause)

REPORT OF COMMITTEE ON ROADS AND ROAD LAWS

By P. S. FENSTERMACHER, *Chairman.*

The question of good roads, from an economic standpoint, is one of the greatest questions before the American people to-day. The Nation's commerce begins with the township road. Any system of roads and road laws that loses sight of this unit as the beginning of all road improvement and sees only a Lincoln or scenic ocean to ocean highway, or one to connect two distant sections of the State, will be more sentimental and ornamental than practical. We believe that a system of highways connecting the rural districts with the nearby market towns and railroad stations, will be a great uplift to agriculture and also to the consumers of all farm products.

The New York State Highway Commission is working out a plan for a system of twelve thousand miles of highways, rearranging its county systems so that there will not be any section of New York State outside of the Catskill and Adirondack Mountains, that will be further away than five miles from any improved state or county highway; and eventually intends to build connecting links in these five mile breaks, so that every man in New York State will have a road twelve months in the year. Former Governor Glynn of New York, in one of his messages to the New York Legislature, has said that macadam roads were costing New York on an average of \$12,000 per mile to build, and \$1,000 per mile per year to maintain, and at the expiration of ten years, it was necessary to resurface them at a further expenditure of \$6,000 per mile. Governor Glynn did not mean that these excessive construction and maintenance costs were due altogether to political corruption or contract jobbery, but that macadam roads will no longer withstand present day traffic. I have cited New York State merely as a neighboring example, showing that with all their millions of bonds issued, the road problem with them is not yet solved.

Here in ours, the Keystone State, a proposition just as gigantic confronts us. Our percentage of improved roads is only four per cent. or three thousand four hundred and seventy two miles, out of a total of eighty-seven thousand, three hundred and eighty-six. What are we to do? Shall we construct roads that are not going to stand present traffic conditions, or shall we build permanent highways that, although somewhat higher in initial cost, more than balances in the matter of maintenance. We are all aware that it will be many years before even all the main highways are permanently constructed, and that, for a generation at least, most of the highways and byways of the State will remain what are termed dirt roads. It has been amply demonstrated that these dirt highways can be made excellent roads eight months in the year and passable the other four months, by following just a few simple rules in road maintenance.

First. Proper drainage.

Second. Sufficient crown to shed water.

Third. That the Road Drag, properly applied, is the most efficient and economical implement with which to maintain a dirt road.

An expert on modern road construction has given me the following figures as to original cost and maintenance costs for the types of pavements now being constructed throughout the country, all based on the per mile with a width of sixteen feet.

INITIAL COST

Macadam, \$8,000 to \$11,000.

Brick, \$15,000 to \$18,000.

Concrete, \$12,000 to \$14,000.

MAINTENANCE

After 2 years, 10%.

After 5 years, less than 10%.

After 5 years, less than 1%.

With all the experimenting that our State Highway Department has done with macadam, it has been demonstrated that it cannot construct such a road that can be economically maintained. Too long has the State been building such roads at a great cost, and without any provision for their timely maintenance, allowing them to go to rack and ruin. And whoever was responsible for this, was criminally negligent.

As to the brick method of road construction, we find from a report of the Milwaukee County Highway Department, from a section of the State of Wisconsin where, for a number of years, many different kinds of paving roads have been built, the subject as they are to heavy motor traffic, as well as to a large tonnage carried in horse drawn vehicles, our highways demand a surface which can withstand the greatest amount of abrasion. Water bound macadam, or gravel, is out of the question, brick or macadam foundation is unsatisfactory, and if laid on concrete foundation, becomes too expensive. In similar manner, bituminous macadam, or bituminous concrete, is unable to stand up unless placed on a permanent foundation, and the element of cost therefore arises again.

Also, the other types of block pavements are excessive in cost. In sections of our own State where bituminous macadam or bituminous concrete roads have been constructed, it has been found, when built to a width of 16 feet, to be very objectionable from both the standpoint of excessive cost, as well as not being a suitable road for horse drawn traffic, the surface being too smooth and hard so that horses have no footing and are unable to draw more than half a load up any slight grade, frequently slipping and falling down upon stretches that apparently have no grade. A beautiful well built road of bituminous concrete construction situated in the eastern part of the State has become a motor speedway, horse traffic making detour of miles to avoid using it on account of danger of injury to horses by falling. Also, in the same section, a bituminous macadam construction across the South Mountain, the same difficulties have been experienced, horses having no foothold, being unable to draw half the loads as before the road was improved. The complaints against this method of surfacing becoming so numerous that the plans for completion of this road have been changed to a macadam and it has been thus constructed.

Referring again to the report of the Milwaukee County Highway Department, they give the following as the reasons for the selection of concrete as a paving material.

First. Durability.

Second. Low maintenance cost.

Third. Cheapness and availability of materials.

Fourth. Simplicity of construction.

Fifth. Low initial cost.

These all resolve into a question of economy which, when combined with ease of traction, smoothness, non slipperyness, cleanliness, and sanitary qualities, make concrete as nearly an ideal pavement for rural highways as could be devised for Milwaukee county. We believe that similar results can be obtained in Pennsylvania, through a properly constructed concrete pave. With mills for the manufacturing of cement, and with other materials for concrete work near at hand in all sections of the State, this method of road buildings is certainly more economical and practical than the imported asphalts required in the construction of the bituminous surfaced paves. To increase the efficiency of the paved roads, and also, reduce their cost so that it will be possible to construct roads of this nature throughout the entire state, we recommend that a plan for road building somewhat similar to the old time turnpike, with eight foot pave construction in the center, allowing for an additional eight foot of macadam on one side, and eight foot of dirt road upon the other side, giving a total road bed of twenty-four feet, suitable for all manner of traffic, at all the seasons of the year:

Ditch.

8' Macadam

8' Pave

8' Dirt

Ditch.

For reasons of safety, utility and economy, we further recommend that no road should be improved that is of less width than twenty-four feet from ditch to ditch. Whatever system, or kind of materials, for building of improved highways are selected, the aggregate cost will, for all time to come, be a severe drain upon the revenues of the State.

We heartily endorse the recommendations of the Special Road Committee for the purpose of devising ways and means to build and maintain the highways of the Commonwealth, as reported and adopted at the Stroudsburg meeting of the State Board and printed in Department of Agriculture bulletin No. 253. We would call special attention to the third item, which recommends, "a pay as you go" policy, and as opposed to a bond issue, feeling confident that the revenues of the State, properly applied, are sufficient to carry on this work. We believe that the indiscriminate appropriation of the State funds for all manner of educational and charitable institutions not owned or controlled by the State, many of which could, by proper management, be made self-sustaining by the municipalities in which they are located, is both wrong in principle, as

well as of doubtful legality. We believe the appropriation of the State funds to any educational or charitable institution under sectarian or denominational control, to be unconstitutional, and that it is time to call a halt. The results of such foregoing mentioned legislation have been vicious and demoralizing, being a constant temptation to unscrupulous persons to apply for State aid for the establishment and maintenance of such institutions, a new crop being born and aided at every session of the legislature through the disgusting log-rolling manipulations to secure the passage of a bill for their support.

As to road laws, in an address before the American Association for the Advancement of Science, by Logan Waller Page, Director of the United States Office of Public Roads, the Pennsylvania Highway Department was cited as being one of those in which millions are wasted through political manipulations. This being a serious charge, with no specific acts mentioned, it may be well to quote more of his address in order to see in what he states a parallel of the conditions as many of us may have observed them. Mr. Page's reference to this State and its political road building was part of a general discussion of conditions throughout the country. The American people, he said, just build up a wall of protection against political meddlers in all branches of public service. We have in our public road system, if it can be called such, approximately, 2,300,000 miles. The people, as a public corporation, are consenting to the expenditure of about two hundred millions in a haphazard attempt to make this rash endeavor pay. That it is a losing investment, conducted on lines directly opposite to those of the best managed private corporations, is an established fact. It is estimated by experts that every year the American people lose at least fifty million dollars because of their careless supervision of the traffic facilities; it is the lack of definite responsibilities which bring about the failure of the local work, and State supervision seems to be the first and most effective step toward obtaining satisfactory road conditions. To safeguard against the many evils confronting the people of the state in planning their systems of road management, the following is offered by Mr. Page:

"First, the appointment in each unit or substation that number of road officials necessary to do the definite duties and placing upon these men the distinct responsibility for the work done.

Second, some arrangement should be made whereby the road officials shall give the roads systematic and continuous attention instead of the irregular care which has proved so costly in the long run.

Third, the requirement of necessary qualifications which the road official must possess to discharge his duties efficiently.

Fourth, the demand that the incumbent of any road office shall be appointed because of his qualifications in this way eliminating those who are more able as politicians than as engineers.

Fifth, road officials would serve best the people if the term of office was limited by merit and not terminated at regular periods.

Sixth, provisions should be made for a careful study of traffic needs in the various localities, so that political considerations may not be the deciding factor in the location of road improvement, distribution of appropriations and appointment of needed officials.

The people should have a strict, clearcut, civil service legislation, applicable to the entire road system in each state, which would give them the necessary power to recall incompetent officials.

Most decidedly, all subordinate positions should be filled by rigid competitive examinations, without regard to party affiliations.

Perhaps, however, the most effective measure of safeguarding the state highway department from the destroying influence of politics is to place it under the general control of a commission. This commission should be non-partisan, non-paid, constituted partly by appointment and partly ex-officio, on which would be represented the educational and scientific institutions of the state, the appointive members alone being laymen.

These men should be trusted to select the chief technical officials without prejudice and with due regard to their qualifications."

Coming from such high authority, these advanced but common sense views upon this great question, are certainly worthy of careful consideration. We believe that their application will bring about a new era in the State's highway construction and management so that before many years, Pennsylvania's reputation for good roads will be redeemed.

REPORT OF COMMITTEE ON FRUIT AND FRUIT CULTURE

By W. F. BIDDLE, *Chairman.*

Mr. Chairman and Members of the State Board: The apple crop of 1914 will go down in history as one of the largest, the yield being about 20,000,000 bushels. With this large yield, thousand of bushels went to waste for the want of a market. We have found that part of this waste could have been prevented had there been a canning factory or evaporating plant in easy reach, or had they followed one of the two established systems of retaining soil moisture, or thinned their fruit. The long and severe drought, which covered nearly the whole area of Pennsylvania, influenced the undersize of the fruit. There are a number of fruit growing sections that ought to have canning factories. There is a demand at the city bakeries, restaurants and hotels for canned apples, with the variety named labeled on the can. Much of this waste may be traced to a lack of co-operation among fruit growers. It is our duty to see that nothing is wasted when there are so many hungry to be fed. Too large a percentage of the fruit growers are not careful how they handle their fruit at picking and packing time: then when their fruit is put on the market along side of that of the careful and efficient grower, he receives from \$1.00 to \$2.00 less per barrel on account of their carelessness.

Now it pays to do things right. The last season there were apples sent to the Philadelphia market by some of our Pennsylvania farmers and fruit growers that were not honest and straight. There was no uniformity in size and color. In several cases I believe the object was intentional deception. Improper methods of displaying fruit have been practiced on several occasions. Great care is taken to have the large and highly colored apples placed in such a position that they can be seen and at the same time hide the undersized ap-

ples. Upon investigation I found that these persons must each year hunt new buyers for their fruit. It is with some effort that I make these conditions public, but they are nevertheless facts.

PESTS

In many sections of the State the San Jose scale is held in check, in others it has practically destroyed the orchards and very little or no effort was made to prevent their destruction. The Aphis, during the past year have done a great deal of damage in the State. These can be kept under control by spraying just as the buds open. The Codling moth is the one that is causing the careful grower a great deal of concern. For the man who can put up the 100% clean box or barrel is the man who gets the premium. We have found that in many cases the spraying is done by the "get done quick" method. This is a waste of time and material. If you do not want to do it thorough, you better not do it at all.

OVERPRODUCTION

The cry of overproduction is still ringing loud over the country. From a report given me it is estimated that there were 40,000,000 less trees in the United States in 1910 than in 1900, against an increase of 20,000,000 in population in the same length of time. As our population increases just in such proportion will the consumption increase, provided we give them clean and straight fruit. Fruit tree planting in Pennsylvania is growing less. There will not be as many planted this year (1915) as there were last year (1914). From what I can gather if the present rate continues in the year 1920, 50% of the present farmers' fruit trees will be dead. In the State there are many places where whole orchards are bad from lack of proper care. So it behooves us to control the scale, codling moth, aphis and all the rest of the enemies of the fruit grower.

It is always the one that sticks to it that wins in the end. I know that the practical, up to date and efficient orchardist is the one that will win. From what I have learned I believe that in every established fruit county there should be an information bureau, whose business it would be to ascertain where apples, or other fruits, can be handled to best advantage, and to keep the growers informed as to the prices and to assist in establishing a standard for the county, and then maintain that standard by being honest. There were only a few counties reported less than 100% and some as much as 500%. 100% indicates last year's crop.

The peach crop was heaviest in the southeastern part of the State, Montgomery reporting 2,000,000 baskets. In many of the other counties the crop was a total failure. In some places peaches sold from \$1.25 to \$1.60 per basket, but in some orchards they were as low as 25 cents per basket. This confirms me that this Board ought to devise some means whereby the over supply could be sent to other counties where the supply is not sufficient for the demand and sold at a reasonable price to the consumer and at a profit for the grower. Mr. L. W. Lighty quoted October 17th that he saw peaches sell at \$1.50 per basket 54 miles from the orchard where they were bought for 30 cents per basket. I believe we would be of much benefit to the

grower if we can help him solve some of these problems. There is too wide a gap between the producer and consumer and there has been no bridge sufficiently strong to span this abyss. The foundation is bad and when either party attempts to cross, down goes the bridge. So it is with the consumer or producer if either one tries to take advantage of the other.

REPORT OF THE BOTANIST

By PROF. FRANK D. KERN.

In making this report, your speaker has some misgivings. In the first place, he has not resided in the State long enough to feel thoroughly acquainted with the problems offered in such a diversified length of time that a report of this sort would be expected.

Botany is a broad and fundamental subject. As a division of science there comes under the head of botany much information which is of interest and importance to the agriculturist; but it is my experience that few people who want such information know where to look for it. This point is well brought out by an examination of correspondence. If a man wishes information about farm animals he has a pretty good idea that he should consult someone interested in animal husbandry; if interested in farm crops, he looks to an agronomist, and so forth. Questions, however, which ultimately come to a botanist are pretty likely to be asked of someone else first, or addressed to a general board or to an institution. This is not strange, after all, for botany deals with plants in all their phases.

While it does not represent any industry, it is very closely related to several. Forestry and horticulture are very much dependent on botany. The whole problem of soils and their handling and fertilization is related to the physiology of plants, which is but a phase of botany. Bacteriology, dealing with a particular group of plants, may now seem very distinct, but it is simply a split from the general subject of botany. Scientific plant breeding has been developed because of an outside demand, but it owes its methods and rapid advancement to the fundamentals coming directly from botany. The latest and one of the most important phases of botany deals with the diseases of plants. This phase we know as plant pathology. While there is some tendency to separate it from the mother science, I think I may say safely that it is still to be considered as belonging to botany.

To be more specific, I may now treat briefly some of the practical botanical questions which are of general interest as is evidenced by the character of our correspondence. In the first place, I may speak of the requests which come to us to name and identify plants; the species are likely to be anything from grasses to trees. Very frequently the specimens are entirely inadequate, being fragmentary

and injured. I should urge everyone present to assist in this matter by advising, whenever opportunity affords itself, that carefully packed, ample, representative, specimens accompany requests for determination. While many of the plant identifications are purely general, a large percentage of them have to do with plants which are recognized pests, or weeds. Usually these are accompanied by requests for information concerning methods of eradication or control. Here the domain of the botanist gradually shades off into that of the agronomist.

Concerning the question of eradication of weeds, I cannot improve upon the statement of your former botanist, that "there is ordinarily no quick, shorthand way of getting thoroughly rid of pestiferous weeds." I am sure, nevertheless, that all of us have felt much encouraged over the developments in recent years of spraying in this connection.

You will be interested in hearing, I am sure, that there has appeared during the year, the publication of successful results in the results in the control of wild garlic. This investigation has been carried on at the Indiana Experiment Station. The spray material used is a petroleum product sold by the Standard Oil Company under the name of orchard heating oil. It is a complete spray, killing all vegetation which it strikes, and not a differential spray like iron sulphate, which kills weeds but does not injure the cereals. The results are very promising.

Closely allied to the subject of weeds is that of poisonous plants. We have had during the year several inquiries concerning the eradication of poison ivy. It has been logical to suggest the pouring of some chemical solution about the roots of the plants. One correspondent reported back to us that he had good success with strong, hot brine. In this connection, it might be interesting to point out that the usual bad effects from coming into contact with poison ivy may frequently, and perhaps usually, be avoided in a simple manner. It consists in thorough washing, with the aid of some good laundry soap. If the washing is not delayed too long after contact with the ivy, the chances of poisoning are very much lessened.

Questions relating to seeds are also constantly coming up and these are frequently of a botanical nature. Questions concerning the purity and germination of farm seeds have been considered, commercially, so important that the last Legislature saw fit to pass certain laws on the subject which, I believe, are administered by the Secretary of this Board. Reduction in yields of cereals, particularly oats and wheat, are often due to smuts and other diseases which are carried over from year to year on the seed. The spores which carry them over are microscopic and are, therefore, not detected by ordinary methods of examination. The presence of such diseases is in reality just as much an adulteration as is the presence of the weed seed, and the result is many times just as serious. The carrying over of such diseases is all the more lamentable since the seed can be disinfected easily and cheaply. I refer to the formaldehyde method. The seed is sprinkled with a solution of one pint of formaldehyde to forty gallons of water, covered with sacks or burlap for two hours, and then raked out and allowed to dry. Every farmer should treat all unknown seed of oats and wheat, or all seed from a crop which was smutty or diseased.

A large number of inquiries are received every year concerning the possibilities and problems along the line of the cultivation of medicinal plants, and the past year has been no exception. Historically, the cultivation of such plants is really one of the oldest agricultural industries in the United States, and yet the progress has been very slow indeed. Fortunately there has been some experimental work and we are able to offer some suggestions. We perhaps have more inquiries concerning ginseng than any of the others. We have a circular (No. 28) from the State College which we furnish to all making inquiries along this line. We have also been making references to Bulletin No. 27, of the Pennsylvania State Board of Agriculture entitled "The Cultivation of American Ginseng in Pennsylvania," but I am not certain whether this is still available. In the past there have been two reasons why the cultivation of drug plants has been necessary (1) the growing scarcity of the wild sources of supply and (2) the possibility of improving the plants so that a more uniform and increased quantity of drugs may be produced. During the year the outbreak of the European war has cut off the foreign supply of many crude drugs and has forcibly brought to our attention the necessity for increasing our domestic supply. We are very much in need of further investigational work in order to take care properly of the inquiries and to encourage this industry in the way that its importance would warrant.

We are receiving also a steady stream of communications regarding mushrooms. Some of these refer to the edible or poisonous properties of wild forms and some refer to the cultivation of the common mushroom of the markets. We are doing everything to encourage a proper and safe use of the wild mushroom crop. In addition to the identification of the specimens, we give out by letter many suggestions. It is our aim to have people learn and become acquainted with some good sorts and to have them leave all others alone. There is absolutely no test for determining the bad or undesirable sorts so that they can be cast out of a miscellaneous gathering. One should never eat any kind with which he is not familiar or which has not been identified by someone who knows. It is possible to learn to know the species just as one learns to know flowers or birds. A lumberman does not accept trees because they have certain characteristics, or reject others on such grounds, but he insists on knowing the kind of trees. This same thing must be insisted upon with regard to mushrooms. In certain parts of the State mushroom growing is an important industry. The people who are in the business frequently find their crops affected with pests and diseases. Many other people have heard of the possibilities along mushroom growing and are seeking information.

As in the matter of drug plant cultivation we are in need of more experimental work. In our own State we have no publication on the subject and can do no better than refer our correspondents to Farmers' Bulletin No. 204, United States Department of Agriculture.

Regarding the matter of plant diseases I will not have time to make more than a few brief references. Protection of crops from the ravages of parasitic diseases is one of our most important agricultural problems. The fundamental idea of the control of plant diseases is prevention. The practical work of prevention is based on facts mostly accumulated by patient scholarly investigating, ex-

perimenting, testing and improving. These investigations must continue. While it is important that demonstrations of known preventions be made, it is much more important that studies concerning causes be pushed vigorously and continuously. Our correspondence shows that there is a large demand for information along the line of crop protection. The members of this Board can do a great service by assisting to create public sentiment in favor of proper legislation for inspection, quarantine, and provision of funds for investigation.

REPORT OF POMOLOGIST

By CHESTER J. TYSON

Another year has gone by since our last report. For the past month or two, various organizations of apple growers have been holding their annual meetings. In looking over the programs of these meetings, one is impressed with the fact that more and more attention is being paid to the business end of apple growing. This does not mean that all the problems of production have been solved; but it does point to the fact that the difficulty of selling the abundant crop already produced is in nearly every mind.

The year 1914 has been a hard year for apple growers. There have been occasional hard years in the past, and there may be many more of them in store for us. There is one encouraging side to such lean years. They may discourage some people from planting trees who have been carried away by the glamour given the business by some magazines and a few, so-called, farm papers. Taken as a whole, Pennsylvania had nearly double as many apples as in 1913. The crop was very well distributed and very few real crop failures have been heard from. The latter half of the season was severely dry in most sections, and this fact, coupled with over-full trees, has resulted in smaller than average fruit. Serious damage from hail has been reported in several places, and serves to remind us that after we have done everything we can to produce good fruit, we are still subject to the whims of Nature.

Among the serious orchard pests of which we hear most this year, are green and rosy apple aphid, canker worms, sooty blotch and pear blight, particularly that form affecting the trunk, near the crown. Marketing conditions, except for early fruit, have not been right.

The usual apple buyers were noticeably absent during the Fall, and very much more than usual of the apple crop went into storage, owned by the grower. Two causes entered into this condition; many buyers were fearful of the future, and those who would have bought, found that the banks were not willing to back them. Market conditions picked up somewhat in December and large stocks of apples were moved then, but the holiday season was dull and conditions

have grown worse rather than better since that time. Tremendous stocks of fruit are still held in storage, particularly New York, Baldwins and boxed apples from the north and west. Both of these classes of fruit are selling already at prices that cannot show profit to the grower. Baldwins at \$1.75 per barrel, with 87 cents charges; large western Staymans and Rome Beauty at \$1.25 per box, with 82 cents charges, hardly can pay the cost of production.

Three prime causes have entered into this condition. First, the crop has been more than liberal throughout the whole country, with a few minor exceptions, more than one-half greater than 1913, and even a little more than the heavy crop of 1912. Second, the war in Europe, both directly by cutting off exports to Germany, and indirectly, by taking so many vessels out of trade that shipping facilities to England are unusually poor, has seriously crippled foreign trade in apples. To be sure, a good many apples have gone to London, Liverpool and Glasgow and have brought fair prices there, but only limited space has been available on refrigerator steamers and ordinary space has proven very unsafe for apples, for they have both frozen and overheated while crossing. So while the prices reported from the other side have been fair, some of the net returns have been very disappointing. Third, it is very doubtful whether the large crop and the loss of export trade combined would have had such serious results if our own country's industries had been going full blast, all hands working full time with lots of money to spend. Some of these things are beyond our control, but I have felt that a survey of them was worth while at this time, in the light of a few things we can do to help the future of the apple industry.

Here are a few points that need most careful consideration. We are right now facing the results of "over planting," all of which we have been talking for years. To what extent are we, each one of us, responsible for this over production? Have we spoken conservatively of our business when asked, or have we gone about boasting of the splendid returns and the ease with which we have secured them? It is an absolute fact that thousand of men have planted hundreds of thousands of fruit trees for the one reason that they have been unintentionally deceived as to the golden harvest to be reaped. Some of these trees will die of neglect, some of them have died. Many of them are alive and bearing fruit. Let us take this lesson seriously to ourselves. If we speak of returns, make sure that we speak in terms of net, not gross, amounts. Imagine if you can, a manufacturer of silks, shoes or automobiles, boasting of the profits of his business to the end that his hearers will wish to become his competitors. The cases are nearly parallel.

And this leads us to my second point. What do we know about cost of production? How many of us know what a bushel of apples really does cost. How long would a large manufacturing enterprise continue to live under severe competition without rigidly figuring all costs? In the season just passed, competition has been keen, business conditions have been dull, and unless we have learned to figure down the cost, we have lost money.

My third point has to do with an entirely different matter, and yet it may touch us as closely as either of these. This seems to be the age of legislation. Our legislative mills grind out a never-ending grist of laws—some good, some bad—but we must be governed by

them. Good laws can help our business; bad laws can put us out of business. Let us stand firmly for the passage of laws which are just and fair to all. A fruit grading and branding bill will be offered in the present legislature. Let us see that this bill is shaped to meet the needs of our fruit growers. Amendments will be offered to the weights and measures act of 1913 session. Let us see that these amendments really improve the act, then get behind them in no uncertain way. It is manifestly unfair to demand in any law that a definite weight be given for a standard bushel of apples. Bulk for bulk, apples will vary nearly ten pounds to the bushel, depending on varieties and stage of ripeness. All of these things point to the real business end of our business and carry out the thought with which I opened this report.

REPORT OF THE CHEMIST

By DR. WILLIAM FREAR.

THE POTASH QUESTION.

The farmers, truckers, orchardists and florists of Pennsylvania have come to use very large quantities of commercial fertilizer. The cultivated areas of the State are being more intensively farmed, so that, although the expansion of cities and towns, the outward movement of industrial plants, and the abandonment of occasional outlying farm enterprises near lumbering operation, when the timber has been cut off and worked up, have very slightly reduced our farm acreage during the past decade, the demand for fertilizing materials has increased. Our systems of animal husbandry are also undergoing a very considerable change. The pasture is being used less, the barn more, and new manure saving devices are more generally used. That means more manure, to the head of the livestock kept, that is available for plow land. On the other hand our numbers of livestock are decreasing, not only relatively to our increasing population, but absolutely.

For fifty years, manure has been more and more substituted by commercial plant foods. The possibility of such substitution together with labor scarcity, and the increasing uncertainty of direct profit in the finishing of beef cattle, has doubtless had much to do with the gradual decrease in farm animals as compared with the total farm areas. In many cases, the system of farm management is such as to place only a minor dependence upon stable manure and to use commercial fertilizers as the direct manurial supply for half or more of the crops. That is one of the reasons why our annual bill for commercial fertilizers is running up from seven to eight millions of dollars a year; and also why we look with concern upon any change in economic conditions that seriously affects any part of the

fertilizer supply. Time was when besides manure, the more soluble part of which carries a relatively good proportion of potash, wood ashes gave us about the only other supply. But now, we burn coal, instead of wood, and that domestic supply has all but disappeared. Cottonseed hull ashes became somewhat prominent, but the New England tobacco growers took all that the South would sell.

Practically all the potash in our fertilizers has, for years, been the product of the governmentally controlled German potash mines. We may approximate the quantity of these salts consumed in Pennsylvania on the basis of our annual fertilizer tonnage reports to the State Department of Agriculture and of the average composition of the several classes of mixed fertilizers analyzed. These figures, for 1913, together with those for potash salts sold unmixed to the consumer, are equivalent to 30,771 tons of high grade salts, together with 3,362 tons of kainit sold as such. Of course, it is not meant that the potash of mixed fertilizers all comes from high grade salts. Much of it doubtless was introduced in kainit and other lower grade products. These figures represent 14,300 pounds of actual potash. The potash salt imports such as are used in fertilizer manufacture were, in 1913-1914 equivalent to 250,000 tons of actual potash. From which it follows that we use one-twentieth of the total import.

The war, when it broke out, found most of our manufacturers quite well stock with potash salts, but the problem for the future was dark and difficult. The call to arms had, according to credible information, cut down the producing capacity of the potash works to one-half the normal. Germany had always used herself a large fraction of the output. Her supervision of agriculture was as much a part of her war plans as that over her arms factories and transportation facilities. With the growing prospect of a long war ahead of her, it was uncertain how much of her diminished product she would reserve to insure her food supplies for the coming year. Although England declared no blockade, her dominant fleet cut down ocean transportation, the use of mines increased carriage risks and ocean insurance and freight rates went up correspondingly. To meet this situation the principal fertilizer manufacturers decided to eke out the potash supplies in hand, and to do it by cutting off the direct sale of potash salts to the consumer, and by making no fertilizer that contained more than 3.5% of potash. In latter August, September and October, sales of potash salts were here and there reported at prices of \$100 to \$120 a ton for muriate. Many of the manufacturers remixed the goods already put up for the market, though the time of contract delivery as only two or three weeks distant. The Department required proper notice to the consumer of all cases in which, in consequence of this conservative policy, the potash supply in the goods was reduced below the previous guaranty of the brand in question.

The net result of these conditions was not a large number of modified guaranties, but a very marked reduction in the number of brands offered for sale. The average richness in potash of the complete and rock-and-potash fertilizers examined in the Fall of 1914 was about 1% less than for the Fall of 1913. Because of the sale of Spring stocks and the failure to remix in all cases, the average potash richness of these two classes of goods was considerably above the 3.5% maximum fixed by the manufacturers; but there were few

samples found of potash salts on sale. By the first of August much, of course, of the Fall buying by consumers had been contracted. The selling prices show no increase in cost to the consumer of the potash he bought last Fall.

What, however, of the coming year? These long nights, when angelic dreams of \$2.00 wheat and maybe \$1.00 corn bless the farmer's bed, it is joy-destroying to have a spectre of potash famine appear in the near background—a real spectre such as the news might well create, that, in October, our imports of muriate and sulphate of potash were only 600 tons, as contrasted with 17,000 tons in October, 1913; of manure salts, 1,225 tons vs. 18,416 tons; and of kainit none vs. 56,000 tons in 1913. In December, Atlanta, Baltimore and New York talked about \$73 to \$75 a ton for muriate, but there was not much to sell. Arrivals in port were few and small. But the week ending January 15th of 3,020 tons of muriate, 685 tons of sulphate, 693 tons of manure salts and 50 tons of kainit were received in New York from Rotterdam chiefly consigned for the most part directly to fertilizer manufacturers, besides other receipts in other ports, and the consideration that the manufacturers by diminishing Fall deliveries were enabled to carry over some of last year's stock for this year's use, ought at least to soften some of the potash famine spectre's alarming effects.

But at the best there must be a great shortage. A 3% maximum for potash is now the line fixed. Still, our new supplies of potash salts probably cost our manufacturers more a ton, and we may expect to give them some of the hoped profit on the wheat we have held for the highest price; and we may well ask how we can economize on potash use. By no means try to economize by buying worthless or very poor substitutes. There couldn't be a better time to push the sales of powered feldspar, phonolith, and stone meal fertilizers. But even now is not a good time to buy them. They probably do the plants a little good, but not enough to put back into your pocket the dollars you spend for them. It would be a good time to develop, if we could, our own potash supplies. The government is hunting for concentrated deposits like those at Stessforth, Germany, but has yet found nothing enough like them to pay working. We are assured that the kelp drifting upon the Pacific Ocean contains enough potash to furnish our supply; but we are not told that it can be furnished at ruling prices.

Some of our ablest capitalists and chemical experts are studying earnestly the possibilities of chemical conversion of the potash locked up in feldspar, aluminite and similar minerals, but have not yet found a way to do it to economic advantage. It is, however, an excellent time better to save your liquid manure, and to get your manure more evenly distributed in the field, and used where it will count most in cash returns; and it is a very good season to use the best seed, and to cultivate thoroughly and at the right time. It is worth while, also, to ask whether you have been getting back all the money you have spent on potash for your general farm crops—I am not talking especially about potatoes, truck and tobacco, but of grains, grasses and even fruits. Of the various Eastern soils upon which field experiments with fertilizers have been made, comparatively few show potash as the food element chiefly efficient for the common rotation crops. Usually rock and potash gives a better

yield of these soils than does acid phosphate alone. But very, very often the extra gain is not enough to pay for the potash.

Remember, I believe in potash fertilizing, but I believe also in good judgment in using this aid. So I do not believe in the economy of buying low-grade fertilizers; but also, I do not believe that potash-rich fertilizers are needed for every crop. Perhaps, too, we can use something else with the potash that will make a pound of the potash do more work. The Rhode Island experiments conducted for years on their acid granitic soil, previously limed, showed that sodium salts, sulphate and common salt, helped out the potash. They couldn't do all the work it did, but apparently they would do part of it. Also, if we have been putting on dressings of potash for years, has it all gone off in our crops and drainage? By no means. It doesn't leach out easily from loams and clays. Most of what the crop doesn't get, stays in the surface layer of such soils, and remains there, at least a large fraction of it, if we may judge by Rothemstead's experience, in a very fair state of availability. If the plant cannot get it out, sulphate of soda, nitrate of soda, sulphate of magnesia, land plaster or common salt may assist. On acid lands, however, I would commend liming with the sulphate of magnesia. Lime itself, magnesian or non-magnesian, will help to liberate this potash, but neither the caustic lime nor crushed limestone is as efficient for this purpose as the salts above named. The coming year may give the American farmer a good excuse for climbing out of his fertilizer rut, and trying in practice more of what his experiment stations and those of other countries have been discovering for him.

REPORT OF COMMITTEE ON DAIRY AND DAIRY PRODUCTS

By DR. M. E. CONARD, *Chairman.*

In reporting the condition of dairy and dairy products in Pennsylvania, at this time, I find it difficult to obtain definite data, that will give a correct idea of statistical conditions. The number of dairy cattle have been steadily decreasing for the past 15 years as a natural result of increased population, together with a supply of dairy cattle that were too cheap to be appreciated and properly cared for. It would seem that increased population and demand would stimulate production; but first the surplus beef, veal and milk had to be consumed, then increased production follows as a necessary result, and not until then. We have passed through this epoch and are now feeling the need of increasing our stock and output to meet the growing demand for human food.

We were, in 1910, nearly 400,000 cows short of 1900 census report, and had about 40% more mouths to feed; and we do not think the conditions are any better to-day as to numbers. A little calculation will show that if every available heifer calf should be raised to ma-

turity, it would require nearly nine years to regain the numbers of dairy cows that existed in Pennsylvania in 1900, and yet no provision for the increased population. Isn't it time that something effective was being done to stimulate animal husbandry in Pennsylvania? We think so. We think the tide has turned and that there are more calves being raised the past two or three years, but not nearly so many as should be. We believe that not only the numbers but the efficiency of our dairy cows should be increased by more intelligent selection and raising of calves. The rapid advance in the price of dairy cows, we believe, is not a calamity but a blessing in disguise. It has the effect to stimulate the business dairyman to better and more thoughtful work, to make the average man better appreciate his cows and breed and select better stock, and it is to be hoped it will; and it evidently has put many of the shiftless farmers out of the dairy business.

I will not take time to discuss market conditions, amount of supplies, prices and the like, because I do not regard that to be the vital point in the dairy business at the present time. The intelligent business dairyman finds a reasonable profit in the present market and the man who is shiftless and disregards all modern and advanced dairy methods and sanitary requirements must do business at a loss, mend his ways, or get out of business. I feel that, facing a growing market, and for better and safer milk and butter to feed the rapidly increasing number of mouths, the vital question to be answered, and to be answered quickly, is how are we going to meet this demand? How is Pennsylvania going to do her share and reap her proportion of the profits of this deal? It will be met and if we do not do it, some other territory will.

There is not an agricultural section in Pennsylvania where, with a little well directed intelligent effort, the amount of dairy products could not be doubled in three years and redoubled more easily in the following three years—and there are lots of people who are only waiting for the necessary information and proper encouragement to make the effort, but they do not know what they are waiting for. "Animal Husbandry" is a branch of agricultural instruction that has been sadly neglected amongst our Pennsylvania farmers and greatly to their disadvantage and loss. For want of just this class of instruction, the Pennsylvania farmers as a whole, I believe, have done more destructive than constructive breeding of livestock. The largest part of the livestock is managed by people who have never enjoyed the opportunities for obtaining such knowledge as is now obtainable and cannot avail themselves of present opportunities. They are generally people who cannot benefit by class work but must depend largely on object teaching—preferably at their own barns, thus getting the principle and its application both at the same time. It is difficult to teach a man facts through his imagination, who has always been accustomed to dealing with the stubborn visible facts. Now we feel that much of the future success of the dairy interest of Pennsylvania depends very largely upon the better distribution of knowledge pertaining to Animal Husbandry, so we urge that there be more effort made through all of the many teaching channels to impart a practical and appropriate knowledge of the better use of livestock on our farms. A better understanding of the advantages to be derived from the use of pure breed sires, what a pedigree and

milk or butter record stand for, how to select a breed best suited to our local and climatic conditions, so as to get their maximum production, the kind of stabling, care and feed best suited to the breed selected. How to produce a better article and at a lower cost, and how to put it on the market in proper shape, then the demand and price will adjust itself.

I want to emphasize the importance of the proper selection of breeds for location. That is something that has been sadly neglected. I don't know that it has been taught very much. We have a widely diversified climate in Pennsylvania and in the eastern part, near Mason & Dixon's line, quite a mild winter. Go to the northern tier of counties and we have it pretty rough and pretty cold. There are breeds of cattle adapted to both of those conditions and it is important if we want the best results to get the right animals in the right place. Pure breed dairy cattle are very artificial; they are the result I know, of man's ingenuity in the way of breeding and selecting and also climatic conditions where these breeds are created. Now when we take them out of those conditions and put them in reversed conditions, opposite conditions, the artificial features acquired which are the dairy features, will naturally be the first features to lop off or to be disposed of and a rapid degeneration goes on. We have not given that enough thought. We have a number of good dairy breeds and from them every section of this State can be supplied with cattle that are well adapted to climatic conditions. A little bit more thought, a little bit more study along that line would avoid a great many failures.

The mixing of breeds is another thing that I think we do wrong, we mix the large and the small breeds, thinking that in one generation we can do what has been aimed at for hundred of years by getting a happy medium that would give a larger quantity of richer milk, or some feature of that kind. Now that is destructive breeding and not constructive. I thank you for your attention. I won't take any more time.

REPORT OF VETERINARIAN

By DR. C. J. MARSHALL

With the exception of the recent outbreak of foot-and-mouth-disease, there is nothing new or unusual for the State Veterinarian to report to the Board of Agriculture for the past year. This disease will be considered at a later meeting. The ordinary diseases that are present and rather common in Pennsylvania at all times are tuberculosis, glanders, hog cholera, rabies, contagious abortion, calf sours and joint evil. The losses from these diseases each year are far too great. Much better results may be expected when there is a more united effort put forth to stamp them out. We have made

progress in recent years handling glanders and hog cholera. There has been no remedy discovered yet that will cure either disease. In glanders our progress has been made in the improved methods for diagnosis, while in hog cholera it has been in the vaccination for prevention. In former times glanders was recognized in horses only when the disease was far advanced. Before this stage was reached the glandered animal may have passed the infection on to man, horses, and mules, which may have died from it before the symptoms had attracted attention in the horse that gave the infection. Later the mallein test came into use. This test was somewhat similar to the tuberculin test for tuberculosis, but much less reliable and mistakes were often made. In some cases healthy horses were condemned and destroyed by its use and in others the test failed to reveal the presence of the disease.

For the past few years we have been using a combination test for glanders that is reliable in practically every case. These tests are made jointly in the stable and laboratory. A special preparation of mallein is dropped in the suspected horse's eye; at the same time a sample of blood is taken from the jugular vein for laboratory examination. If the animal has glanders the eye becomes inflamed in about 12 hours and clears up fully, during the next 24 hours. If the horse is free from glanders, the eye remains clear. The blood examination serves as a check on the eye test. Both of these tests are extremely delicate and often will reveal the presence of glanders in a horse perhaps a year or more before there is a discharge from the nose, an open sore on the body or any other observable symptom. Such an animal is often a greater source of danger than one in the last stages of the disease for the reason that no precautions are taken in the first instance and reasonably safe measures are practiced with the horse with the open lesions.

Where an open case of glanders is found in a stable, it is promptly destroyed and all other susceptible animals are given the eye and blood tests. In some cases from two to twenty per cent. of the non-suspected horses fail to pass these tests. A careful physical examination may show no suspicious symptoms even to one thoroughly trained in the diseases of animals, yet the State recommends that they should be destroyed at once. They are appraised at their actual value and destroyed but the State cannot pay more than two thirds or \$60. An autopsy is then made to see if the condemnation was justified. About 300 such autopsies have been made and no mistakes have been found. It is often difficult to convince the owner that his horse has glanders when it is perfectly healthy, so far as anybody can see. The State could safely pay an owner full value in every case where a mistake is made. The owner would be more easily convinced at times if the State could pay him full value if a mistake should be made. Glanders is seldom seen in the rural section of the State. It is much less common now than in previous years in the large cities and should be exterminated entirely. This could be done rather easily if we were not compelled to purchase horses from other states. It was considered wise to close the public drinking fountains in Philadelphia during the past summer to prevent the further spread of what promised to be rather a large outbreak of glanders. The disease soon subsided and the troughs and fountains were again opened in the fall.

Much more security is felt now in raising hogs; the last census shows a decided increase in swine valuation—it is now \$15,594,000 which is nearly double the valuation in 1900. Most of the security has been brought about by a better understanding of hog cholera. This disease would often wipe out a good herd of hogs in a few days and the owner was helpless to prevent or cure the disease. In anti-hog cholera serum we have a safe and efficient means of prevention. Much more can be accomplished now than in former times by careful sanitary measures. Most hog raisers know how the disease is spread and can fight it successfully with sanitary measures. More might be done in this line. There is a tendency to depend too much on medicine and vaccination even by those intelligently interested. Pennsylvania still uses the serum method of vaccination alone and then only in infected herds. Many other states are still practicing the simultaneous method, in most cases, it will be observed, that the disease is more widely spread than it was before vaccination was discovered. The simultaneous method of vaccination may be good for the individual breeder, but for the State and county at large there can be no doubt of its being a menace to the hog raising industry when it is used indiscriminately.

In the simultaneous method of vaccination, the virus is given to produce hog cholera, then the serum is given to check the disease and make it run a mild course. The nearer the victim comes to dying and lives, the more sure are his chances for obtaining a lasting immunity. Every farm upon which the simultaneous method of vaccination is used, may be considered an infected farm and the disease can be spread from such farms in the same way as from afar, where the disease has occurred accidentally. If serum alone is used in an infected herd, the immunity is just as lasting as where the disease is produced purposely by injecting virus. The simultaneous method of treatment would not be so bad if its use were confined to infected herds only. In these it is not necessary for the reason that the disease will be contracted accidentally. Where virus is used on sound and uninfected herds, the premises become infected and should be looked upon as a menace to hogs in the neighborhood. The more herds vaccinated in this way, the greater the danger to the hog raising community, unless the system is continued as far as the industry extends. The simultaneous method of vaccination may be used safely under certain conditions; these conditions can't be followed profitably or safely at present by the average hog raiser. The State furnishes serum free to the farmers where the disease exists. It must be used by one who knows the disease and has been trained in administering the remedy.

Rabies is found in most all section of Pennsylvania. It affects all livestock and occasionally poultry. Carnivorous animals are the most predisposed to it and are the ones that spread it. There has been nothing new discovered in reference to handling this disease. The Laboratory diagnosis is considered positive. It is believed that but few mistakes are made in ascertaining whether the animal was or was not affected with the disease. Where a case of rabies is suspected, the head of the animal may be sent to the Laboratory of the State Livestock Sanitary Board in Philadelphia and within twenty-four hours the shipper can be notified definitely whether or not the case is rabies. This information is frequently asked for and

is of vast importance in cases where persons have been bitten by animals suspected of having rabies.

There has not been as much rabies during the past year as in some previous years. It is customary to kill animals that have been bitten by dogs that were known to have had the disease. The State allows no indemnity for damage done to stock by rabid dogs. It is possible in some cases to indemnify the owners for such losses from the local dog tax fund. It is also possible to have the Pasteur treatment given to poor people and pay for it out of the same fund. The most effectual way to control rabies would be to destroy the worthless, homeless dogs. This would be a blessing to the sheep industry, as well as assist greatly in preventing the spread of rabies. It would seem that there might be some just law provided that would compel people to confine dogs that are kept as pets or for pleasure, and force the killing of those that are homeless or uncared for.

Contagious abortion in cattle is still receiving much study. Breeders are becoming more familiar with the way the disease is conveyed from farm to farm and from animal to animal, and more effectual sanitary precautions are being practiced in breeding herds. A rather extensive experiment was tried during the past two years in the use of medicated methylene blue as a cure for the disease. Many inquiries were received in reference to the treatment which had been mentioned in a number of the dairy papers. The treatment was first recommended by Dr. Rich, of Vermont, and the State supplied the medicine, with instructions for its use. Some of our breeders claim to have had good results with the treatment, but the evidence collected altogether has shown it to be of no practical benefit.

The most effectual method known for combating the disease is in the line of antiseptics. Considerable work has been done by the State in reference to diagnosing the disease. It has been found that the blood examination or what is known as the complement fixation test will show the infected animals in a high percentage of cases. When the diseased animals are known, can be isolated and kept under antiseptic conditions, it is possible to keep the disease from spreading to other members of the herd and advantage can be taken of the fact that aborting animals usually develop an immunity. They seldom abort the second time and it is very unusual to find one that aborts the third time. Some may become sterile as a result of the disease, but after the second abortion they usually carry the calves to full term. It can be controlled in herds by following the instructions in circular No. 20, which is sent out by the State Livestock Sanitary Board. Breeders of valuable cattle are recommended to adopt rigid sanitary measures for its control.

Many young animals still die each year with such diseases as navel infection, white scours, joint evil, paratyphoid infection and calf pneumonia. These diseases are practically all caused by the same class of infectious organism, and when once they become established in a herd or in a stable, the losses each year in young animals is very discouraging, as practically all cases are incurable and the fatality is high. The only means of meeting the losses from this class of diseases is in their prevention, and prevention can only be brought about by a rigid system of sanitation or what is known in medicine as surgical cleanliness. This can be brought about in a practical

way by isolating the pregnant animals, placing them in stalls that have been thoroughly cleansed and disinfected before parturition, and the dam and young animal kept in such quarters for the first week. The infection in each of these diseases is easily carried on the hands of clothing of the stable help, on the body of the dam, in troughs or buckets that have not been boiled or cleansed, and it is difficult to explain to those who are not skilled in the science of bacteriology the importance of thorough cleanliness.

These diseases, as well as foot-and-mouth disease, tuberculosis, contagious abortion, etc., can easily be carried from farm to farm in skim milk that is returned from the creamery as food for calves or pigs. These diseases may also be carried in the cans from infected herds to the creamery and thus infect the milk and other cans and then be carried to various herds in the community. To meet the dangers from spreading infection in this way, the last Legislature passed a law requiring the pasteurizing of skim milk by heating it to 178 degrees F. It is known that this temperature will kill the organisms that cause these various diseases and that milk that has been heated to this temperature can be fed safely to susceptible animals. During the last few months foot-and-mouth disease has been spread considerably through creameries by infected cans, and milk returned to other farms as food for hogs and calves. In some cases farmers have objected to handling hot milk, and so far we have no economical method for cooling milk properly. For this reason many of the creamerymen have been slow about installing pasteurizing plants. An efficient method for pasteurizing skim milk can be installed in any creamery that is equipped with steam for less than \$10 and this form of pasteurization can be worked with a minimum expense and labor. The only criticism offered by most creamerymen for not installing and using this method of pasteurization is the fact that farmers object to hauling hot milk, and that heated milk does not keep so well when they get it home.

It is hoped that creamerymen and their patrons will soon realize the importance of pasteurizing milk that is used as food for hogs and calves and that each party will co-operate in devising methods for pasteurizing, cooling and keeping milk that will not be a means of conveying transmissible diseases from farm to farm. It is equally as important that cans should be washed and properly sterilized at the creamery or before they are returned to the patrons. Many good breeders prefer to separate the milk at home and sell only their cream. In this way they can escape the danger of bringing new and expensive diseases to their own premises. The Blakeslee pasteurizer does its work in a clean, efficient manner, while many of the improvised methods are unsatisfactory. If the milk is heated to 180 degrees F. with the Blakeslee, run into clean vessels, taken home in clean cans, placed immediately in cold water and fed out of clean pans when properly cooled, there will be no trouble. Milk that is too hot, too cold, or putrid, may cause digestive disturbances especially in pigs. Faulty feeding of this kind can be overcome by a little care. In no case will the loss equal that caused by feeding unheated milk which may have been infected with tuberculosis, foot-and-mouth disease, etc.

The great question of how to handle tuberculosis is still in an unsettled condition. Practically there has been no change made in the

last year in reference to eradicating or controlling the disease. During the first part of the year there was no money obtainable for paying indemnity on animals destroyed when they had been condemned as tuberculous. As soon as foot-and-mouth disease occurred in the State practically all testing for tuberculosis was stopped, for two reasons: It was thought that the disease might possibly be spread by those making the tuberculin test; and the money available for controlling tuberculosis was much more needed in the eradication of foot-and-mouth disease. For these reasons there has been very little testing for tuberculosis done since the middle of October, 1914. In the herds that were tested during the past year, the disease was not as extensive as in previous years. It is believed that some changes might be made in reference to handling inter-state cattle; the present law requires the tuberculin test on all animals over six months of age that are brought into the State for any purpose other than for immediate slaughter.

During the past year the State tested a great many young cattle in Lancaster and Pittsburgh. These animals came from Canada and the West. The percentage of reactions in such animals was very low, practically all the condemnations were from the dairy breeds. Tuberculin tests are not urged or forced upon native herd owners and in no case can they be paid an indemnity for reacting cattle unless they are willing to comply with the requirements of the State Livestock Sanitary Board. They are required to sign an agreement before the test is applied that in case tuberculous animals are found, they will have them properly isolated or destroyed promptly; that the stable will be promptly and properly disinfected and that they will purchase no new animals and place them in the herd until they have been tested and examined by a person authorized by the State.

These restrictions make it impossible for dealers to obtain an indemnity from the State. Even with the restrictions as rigid as they have been, the applications for tuberculin tests have been all that the State was able to handle with the amount of money available. Some have felt that the appraisements are not sufficiently high on cattle that are condemned for tuberculosis. If the limit in price for this purpose is to be raised, it will be necessary to obtain very much more money from the State Government to be used in the work of eradicating tuberculosis. Whether it is advisable to make this move is a question.

A physical diagnosis has been advocated by some and principally by those who are opposed to tuberculin testing. Very little can be accomplished in exterminating tuberculosis where the physical examination alone is depended upon. It is not possible for even the best veterinarians to pick out 5% of the tuberculous cattle by a physical examination alone, and very little headway will be made in exterminating the disease when 95% of the diseased animals are allowed to remain with healthy animals. In tuberculin we still have the most positive method of detecting tuberculous animals. When properly applied, it is accurate in more than 95% of cases.

The State has experimented considerably during the last year with different methods for applying tuberculin. The old subcutaneous form of application is still considered best, yet good results have been obtained in many cases with what is known as the ocular

test, the intradermal test and the intra-palpebral test. For making the last three named tests a special form of tuberculin is required. Under certain conditions they are more reliable than the subcutaneous test and the veterinarian at the present time who is thoroughly qualified and competent to test cattle for tuberculosis, should be familiar with and prepare to apply any or all of these four tests, and in addition to using them, should be able to make a careful physical examination. The person who is properly equipped to make these various tests, combined with a careful physical examination, should be able to detect tuberculosis in more than 98% of the cases, and make mistakes in less than 2%.

Where results so good can be obtained, it would seem advisable to develop these methods to the highest possible standard, and everybody concerned use his efforts to do away with the careless methods that have been practiced in too many cases.

REPORT OF COMMITTEE ON FERTILIZERS

By JOHN SHOENER, *Chairman.*

A year ago, when the Executive Committee honored me with the appointment of Chairman of the Committee on Fertilizers, I promised them to make my report from the farmer's standpoint. The subject of Commercial Fertilizers is an important one to the farmers of Pennsylvania, as it has considerable effect upon their bank account. Next to the cost of labor, the fertilizer bills are the farmers' largest item of expense. The use of commercial fertilizers is continually increasing. In my own section, it has doubled within the last five years. Hay always brings a good price, labor is high, and competent help scarce at any price. This has induced the farmers, in many instances, to reduce their livestock and increase the use of commercial fertilizers. Where most of the crops are sold from the farm, they carry with them a large amount of plant food which they have taken out of the soil. This can only be replaced by hauling manure back to the farm, or by the extensive use of commercial fertilizers. Where the farmer lives close to a city and can get the manure cheap and fresh from the stable, the hauling of manure would probably be the best method to keep up the fertility of the soil; but comparatively few farmers are so situated, and the intelligent use of commercial fertilizers together with green manuring lime is to be recommended.

Much of the money expended for fertilizers is wasted in buying low grade fertilizers which are sold on their brand names and the long double column of figures showing the analysis; where, if the manufacturers were required to print the actual number of pounds of available plant food of the constituents contained, and the sources from which they were derived, the ordinary farmer would, at a

glance, see what he was buying. No farmer would buy 1—7—1 fertilizer, if he knew that a ton contains only $16\frac{1}{2}$ pounds of nitrogen, derived from a very low grade of material, 140 pounds of available phosphoric acid, derived from one-half ton of 14% acid phosphate and 20 pounds of actual potash, derived from low grade kainit. All the plant food contained in such a fertilizer can be bought under ordinary conditions for \$8.25; and yet with an attractive brand name, hundreds of tons of this fertilizer are being sold throughout Pennsylvania at prices as high as \$25 per ton. Fertilizer manufacturers tell us, that such low grades are put up especially to fill a demand for a cheap fertilizer. The intelligent, prosperous farmer will not buy it, but the fertilizer dealer will sell it to the poor uninformed farmer at prices two or three times as high as he could have bought the same plant food in a high grade fertilizer.

I would recommend certain changes in our fertilizer law. First, the repeal of Sections 1, 2 and 3 and the enactment of the following:—

Section 1. Be it enacted, etc., that every package of commercial fertilizer sold, offered or exposed for sale, for manurial purposes within this Commonwealth, except the dung of domestic animals, lime, marl and wood ashes, shall have plainly stamped thereon the name and address of the manufacturer or importer and his place of business, the net weight of the contents of the package, the actual number of pounds in a ton such fertilizer contains of nitrogen in available form, of soluble and reverted phosphoric acid, of potash soluble in water and the sources from which these ingredients are derived. Provided, that no other figures be stamped on the package except the per cent. of nitrogen, phosphoric acid, and potash in an available form, may be stamped thereon in three figures only.

Section 2. Every manufacturer or importer of commercial fertilizers, as specified in Section 1 of this act, shall, on or before the first day of January of each year, or before offering them for sale within this Commonwealth, secure from the Secretary of Agriculture, a license to sell fertilizers within this Commonwealth, for which he or they shall pay the sum of twenty-five dollars (\$25).

Section 3. Every manufacturer or importer of commercial fertilizers shall, annually, at the end of each year or before the first day of January of the following year, file with the Secretary of Agriculture an affidavit showing the number of tons of fertilizers sold within the Commonwealth during the last preceding year; and he or they shall pay or cause to be paid to the Secretary of Agriculture, the sum of ten (10) cents for each and every ton sold within the State during the last preceding year. Provided, that all moneys so received and all moneys received for license, as provided in Section 2, shall be immediately paid by the Secretary of Agriculture into the State Treasury, for the use of the Commonwealth. Second, That Section 5 be so altered and amended as to comply with Sections 1, 2 and 3 and that the penalties as now provided in Section 5 be increased.

I would also recommend that special examinations be made of nitrogenous fertilizers, so as to determine the available and the inactive or insoluble nitrogen present in all fertilizers where the manufacturer makes a guarantee for nitrogen, and that a sufficient appropriation be made to carry on the work.

I would further recommend that in the tabulated analysis of commercial fertilizers of the Department of Agriculture, the actual value of plant food contents be given instead of the computed commercial value. By that, I mean the value of the ingredients contained, at what they could be bought delivered at any railroad station in the State, in carload lots for cash. There is a marked difference between the value of plant food contents and the computed commercial value as given in the Bulletin. The cost of the plant food elements contained in commercial fertilizers increase from the time they leave the wholesale commission house, and by the time they reach the farmer, who buys in small quantities from the local dealer on time, the cost has doubled and trebled, if low grade fertilizers are bought.

By co-operative buying of the various materials and intelligent home mixing, one-half of the money expended for fertilizers by the farmers of Pennsylvania, could be saved. The intelligent farmer is in a position to know better what his soil and his different crops need, than the fertilizer manufacturer, many of whom have never seen a pound used on the farm. He can mix his fertilizers to suit any crops or conditions. In case of a quick growing crop, he can get his ingredients from sources that contain the plant food in the most available form. If it is a slow growing crop, he can get his plant food from sources that are not all at once available, but that become gradually available as the plants need it. Where, if he buys ready mixed fertilizers, he does not know from what sources the different elements are derived or when they become available. Farmers, who mix their own fertilizers, use higher grades of fertilizers, than those who buy ready mixed goods, and consequently grow larger crops.

During the year 1914, 340,000 tons of commercial fertilizers were used by the farmers of Pennsylvania, for which they paid approximately \$8,000,000; of this amount, not more than \$3,650,000 went for materials; \$680,000 for mixing and bags, \$680,000 for freight; and about \$3,000,000 for officers' salaries, dividends, traveling salesmen and local agents' profits. The average price to the farmer was about \$23.00 per ton for an average analysis of about 1—8—4. This fertilizer contained plant food worth last year less than \$13.00. There were instances where it was sold by local dealers for \$30.00, a 5—6—6 for \$60.00, a 14% acid phosphate for \$20.00, and a 0—6—3 for \$17.00.

No farmer can afford to pay such prices for fertilizers and the farmer who pays such exorbitant prices knows very little about them. If the laws could be changed, as recommended in this report, and the actual value of fertilizers given in the bulletin, farmers would soon learn what to buy and what to pay for them. The fertilizer manufacturer would have to adjust himself to new conditions and the dishonest manufacturer would soon be out of business. There would still be a good honorable business for the honest manufacturer. He would no longer be bound down to a licensed brand or brands, but would be at liberty to sell any analysis that the farmers wanted, and under the new law, they would know what they were getting. By cutting down some expenses, such as high salaries, traveling salesmen, local agents, and long term credits, and sell direct to farmers in carload lots for cash, the farmers could get

their fertilizers ready mixed, better than they are able to mix it themselves, and still have just what they want and at reasonable prices.

REPORT OF COMMITTEE ON WOOL AND TEXTILE FIBRES

By JAMES M. PAXTON, *Chairman.*

Sheep were raised in the earliest times for their pelt and without regard to the wool. They were the earliest domesticated of any of the wild animals, and this domestication, together with the breeder, has changed the character of the animal very much. At the present time there are but few wild sheep known. History tells us that God's chosen people had all their richest attire made of the product of the sheep, and of the Jewish maidens holiday attire being woollen garments made from the finest and softest wool.

By consulting statistics we will readily understand why the production of wool has been the one purpose which our sheep breeders have had in view. Beginning with the year 1825 we find wool selling at seventy-five cents per pound, and the average price for twenty-five years from that time was fifty-four cents per pound. Beginning with 1850 we find wool selling at an average for the next quarter of a century of over fifty-five cents per pound, and during the time from July, 1864, until the following spring, it sold for \$1.00 per pound. No wonder breeders were stimulated to produce wool. About this time the American Merino sheep was produced, which as a wool producer, has no successful rival. Beginning with the year 1875 we find for the next 12 years fine wool sold at an average of only forty-one cents per pound, and from that time to the present the market has drifted downward until now wool has become so low that sheep raisers are paying more attention to the production of mutton. Sheep raising does not seem to have been undertaken on so large a scale as perhaps it should, as sheep yield a double return—meat and wool. As a meat-food animal sheep have never been sufficiently appreciated in the United States. They are, however, of very great value and must be classed with swine and poultry as the most available animals to supply meat for home use on the average farm, as they are readily slaughtered, the meat can be kept without difficulty, it is nutritious, wholesome and palatable when properly cooked.

Sheep are more prolific than most farm animals, the increase being 100 per cent. or better in some cases. Government data shows an alarming decrease of livestock in recent years. The receipts of sheep at six of the leading markets for September, 1913, and 1914, show a total decrease of 301,686. There is a world shortage of sheep. The population of the world has increased near 30 per cent. in the past 15 years, but practically no increase in the number of

sheep, and six of the leading markets of the United States show that the receipts of sheep in 1914 was 777,134 less than in 1913, and in fourteen markets including those just mentioned we find a shortage of 950,000 sheep. With the European war on hand and the armies being followed by bands of sheep for food, it is quite to be expected that the 113,600,000 sheep now owned by the warring nations will be almost exterminated before the war ends. Besides the increased demand for wool by these nations, large orders for army blankets and clothing have been placed here by the French Government. With the present prospects of a wool scarcity and the fact that we have a vast amount of land here in Pennsylvania well adapted to sheep raising—rough hills too steep to cultivate—that should remain in permanent pasture and are not as yet infected with parasites—I would urge all farmers to raise some sheep. It may be the time of large flocks in Pennsylvania is past, but now is the time for a small flock on every farm.

A sheep bred exclusively or chiefly for wool must necessarily be valued in proportion to the value of the fleece. The wool of a pure-bred Merino of any value should stand at right angles to the skin, presenting a dense, smooth, even surface on the exterior, opening only in those natural cracks or divisions which separate the fleece into masses. These masses should not be small in size or they indicate excessive fineness of fleece, (a quarter of an inch is the limit in this respect) nor too large, lest the wool be coarse or harsh. The length should be such as combined with thickness of staple will give the greatest weight of fleece. Medium wool is generally in greater demand than fine wool, and is more profitably produced. Two or three inches is probably the most desirable length of fleece for profit. The wool should be sound, that is, of even strength from end to end, of the fibre. It should be highly elastic and wrinkled, curved or wavy, the number of these curves or waves to the inch is not so much a test of excellence as their regularity and beauty of curvature. The softness to the touch in handling is an excellent test of quality so much prized by manufacturers.

Much space you say is given to the Merino sheep in this report. The Chairman of your Committee represents a county which the Merino sheep made famous as the first and best fine wool producing county in America. The latest available reports show the county clip of wool to be around 1,000,000 pounds and the market quotations 28 to 30 cents per pound. In November, 1914, at Buffalo, Washington county, during one session of the Farmers' Institute, 22 sheep owners present reported having on hand 3,670 sheep, and it was also stated that within a radius of eight miles, 5,000 sheep were owned. The last census showed that 196,000 sheep were owned in Washington county. It is the prediction of your Committee that many of the boys now being reared on the farm will remain there and raise animals to restock the nations now at war, and a great future is in store for the Pennsylvania sheep man. We give the following reasons why most all Pennsylvania farmers should raise a few sheep:

1. They will thrive and do well on the rough hillsides better than any other of our farm animals.
2. They are the cheapest means of eradicating weeds on the farm.

3. They are more economical to feed than any other farm animals.

4. They do not require much labor and bring good returns.

5. They add fertility to the farm acting as nature's manure spreader.

6. The prospect of the foreign demand for sheep and wool caused by the European situation will make the business even more profitable.

FOR THE BENEFIT OF THE SHEEP BREEDERS

We would recommend that the present dog law be amended so as to include the following provisions:

First: That the assessor be required at the time of assessing the property of every property holder of his district, as now required by law, to make diligent inquiry as to the number of dogs owned, harbored or kept by the person so assessed; that such person so assessed shall pay immediately to the township assessor the sum of \$1.50 for each and every male dog or spayed female dog and the sum of \$3 for each female owned or harbored by him or any of his family. That the said sum or sums shall be paid on all dogs over three (3) months of age. That the assessor shall make a memorandum of any dogs on any premises that are not claimed by the owner of said premises.

Section 2. It shall be the duty of the assessor at the time payment is made by the owners of dogs as herein provided, to deliver to each of said owners a metal tag bearing a serial number corresponding with the number on the receipt issued to said owner as herein provided; and said tag shall also have impressed thereon the calendar year for which such tag is issued; said tag to be not less than one inch wide or less than one inch in length; and the general shape of said tag shall be changed from year to year.

Section 3. It shall be the duty of the assessor to publish in two county papers a list of the dogs so assessed giving the name and address of the owner of each dog, together with the sex of each dog and the number on the tag issued therefor: Provided, in the event there is but one paper of general circulation published in the county, then it will suffice if said list is published therein.

Section 4. If upon the publication of the assessor's report, any reputable citizen of such district shall furnish conclusive proof to the County Commissioners of three or more dogs in the community that were not reported as assessed, the County Commissioners shall be required to make an investigation of the accuracy of this assessor's work and see that the penalty of the law is carried out for such failure either of the assessor or owner to make a true report.

Section 5. Upon completion of the assessor's report the County Commissioners shall be empowered to call upon constables or state constabulary to kill all dogs not wearing a license tag regardless of whose property they may be on; Provided, however, that before such action is taken they give due notice through two or more papers that such action will be taken following a certain length of time which time shall be sufficient for any to secure the license tag for their dogs who have not done so at the time of the assessor's report. Further, that upon conclusive evidence of three or more dogs running

at large in any district or community, the County Commissioners shall be required to employ someone to kill any unlicensed dogs in such community.

Section 6. That it shall be the duty of every person owning or having in charge any dog or dogs, to at all times confine such dog or dogs, to the limits or of his own premises or the premises on which such dog or dogs is, or are, regularly kept: Provided, That nothing in this act shall be construed to prevent the owner of any dog or dogs, or other person or persons having such dog or dogs in his or their charge from allowing such dog or dogs to accompany such owner or other person or persons elsewhere than on the premises on which such dog or dogs is, or are, regularly kept.

Any persons violating this provision shall be deemed guilty of a misdemeanor and shall be fined not less than two nor more than fifty dollars, one-half of such fine to be payable to the officer or other person furnishing the evidence upon which such owner or other person having such dog or dogs in his charge is convicted of such violation.

REPORT OF MEMORIAL COMMITTEE UPON THE DEATH OF GENERAL JAMES A. BEAVER.

It is not given to very many of the sons of man to win high title as a commander of valiant warriors, distinguished consideration as an executive statesman and general commendation as an administrator of justice from the Appellate bench of his native State. To have richly earned the right to wear the several titles of General, Governor and Judge in so important a civic body as Pennsylvania, and to have worn each of them so worthily as to have won the generous approbation of his fellow-citizens, places the life of the man whose accomplishments these were, almost as far above eulogy as it is beyond criticism, and lays upon him who has been called to pronounce its memorial a difficult though gracious task. Such a man was James Adams Beaver, and such were his achievements. If, however, the recital of these successes or even their most extended amplifications were to be the limit of the memorialist's work, it would be but illy done; for the character of which they were, at once the sequel and the exponent, furnishes the larger and richer field of exploration.

Large as James A. Beaver may have loomed in official life, he was larger as a man; a manly, courageous, just, kindly man, of wide intelligence and broad views; of strong faith, bright hope and abounding charity, as exemplified by his work; and from his early youth to his last day, a man who walked uprightly before his God. While yet in his very early manhood he set for himself a worthy purpose, established reasonable standards of living, strengthened his self-control and found pleasure in such self-development as would enable him to be of service to his fellow men.

Probably the most distinctive attribute of General Beaver's character, if, indeed, it were not its very keynote, was his exalted conception of the duty, and more particularly the joy, of service; service to his family, service to his neighbors, service to his town, his State, his country, and service to his Lord. Only those who knew him best realized the keen delight he felt in doing something for somebody or even anything for anybody. However arduous may have been any duty required of him, whatever may have been the difficulties of any task assigned him, he undertook it with undaunted courage and large faith and its accomplishment, if accomplishment were possible in the best way and to the best purpose for which his physical, mental and moral powers equipped him, was certain. Whether, as a second lieutenant, drilling the "awkward squad" of the "Bellefonte Fencibles" before the outbreak of the Civil War; as a colonel guarding the cross roads at Spottsylvania Courthouse, or as a general fighting his brigade and losing his leg at Ream's Station; whether as councilman or burgess of his home town or as Chief Executive of his native State, financing the relief of the Johnstown Flood victims; whether as a prep student at the Pine-Grove Mills Academy, as member of the graduating class of Washington College, or Chairman of the Governing Board, and sometime acting President of Pennsylvania's great State College; whether as a student at law in the office of his future father-in-law or a dispenser of justice from the Appellate Court of his State; whether teaching in his home Sunday school, counseling the Y. M. C. A., serving as ruling elder of his own congregation or moderating the National General Assembly of his loved Presbyterian Church; the same cheerful spirit, optimistic energy and absolute integrity of purpose, spurred him to give the very best service of which he was capable. He represented, whether as "Farmer," "General," "Governor," or "Judge," the highest type of American citizenship devoted to service.

It was not the least of the many distinctions which came to this all-round man, nor was it the one which he least esteemed, that from the time he was commissioned lieutenant of the "Bellefonte Fencibles," in the late fifties, by the then Governor Packer, who was himself a native of Centre county, until for the last time in his noteworthy career, he received re-appointment as member of this body from Governor Tener, he held a commission for every Governor of the State, excepting of course, himself. By the commission as Governor, received direct from the people, he automatically became, for the first time, a member of this body. His after service on the Board began with a commission from Governor Stone and was followed by those of Governor Pennypacker, Governor Stuart and Governor Tener, which latter remained in force until the Grim Reaper brought him his final commission, commanding him to "Come up higher."

It is by warrant of these commissions that we memorialize him to-day. These appointments and the commissions they carried with them, were by no means complimentary; for be it known that as a farmer, in his private life, a practical farmer of his own farm, he was governed by the same characteristics that exhibited themselves in all his work, whether as soldier, executive or judge. His large abilities and fine successes as a practical farmer were the efficient reasons for his several appointments as our earnest and efficient colleague. That high conception of the duty of service which governed

his actions in all other walks of life, gave him such an appreciation of the soil as, excepting only the mind and soul of man, the most important of God's creations, as comes to but few farmers; and led him to give his best efforts to the problem of not only maintaining its power to produce, but even more strenuously to the greater one of increasing that power in each successive year. Justly proud as he was of his fine crops, he experienced a more real and lasting satisfaction in the fact that each rotation of crops left the soil better than it found it.

Of his devotion to the agricultural interest of the State as a member of this body, it is almost superfluous to speak in this presence, for it was patent to all. His clear, strong advocacy of measures which met the approval of his judgment, or his spirited objection to any which did not so justify themselves, were alike in keeping with his views of best service. His cheerful, frank manner, fine voice, enlightened judgment and clear reasoning were among the best assets of the Board, and we can but deplore their absence. In ripeness of years and fullness of good work he was gently ferried across the Dark River, and while we regret his departure from among us, he views with clarified vision the brightness of the glories which, while here, he could see only through his uncompromising faith. The epitaph which would best befit his resting-place would read: "He stood four-square for service to his Creator and his fellow-creatures."

SUPPRESSION OF BOVINE TUBERCULOSIS

By DR. H. O. GILL, *New York City.*

Mr. Chairman, Ladies and Gentlemen: I think the first thing I ought to do would be to square myself with those present. Your Chairman has introduced me as an authority. Just as soon as anyone assumes that title or assumes the title of an expert, he is in trouble for the reason that they will quote an authority on page so and so and ask you if you believe the doctrine laid down by that authority. Now I don't want you to ask questions along that line. I am simply an ordinary, everyday, practical veterinarian, with an experience of many years, although I may not look it.

We have a subject, tuberculosis, the suppression of tuberculosis. It is a subject that has been threshed out from time immemorial and it seems even at this day not to be clearly understood. It is not clearly understood for two reasons. The first reason is that many scientific, technical gentlemen try to enlighten the general public by using technical language. To-night I am going to try and, as a matter of fact, will avoid the use of all technical Latin terms or words.

Why do we want to suppress tuberculosis? That is the vital point; why do we want to do it? So far as tuberculosis, transmitting that disease to the human family, they tell you that pasteurization will do away with that danger. Now then we get back to the economic proposition, we get back to your own welfare regarding your cattle, and the question is, do you want to breed and keep on breeding tuberculosis among your cattle? You can make your herd more profitable if you have a perfectly healthy herd, a herd not only free from tuberculosis, but free from every other disease. The product of those cows will command a higher price, and it has often been said they want us to do these things, but they won't pay for it, and I want to tell you right now that they will pay for it, you can compel them to pay for it. Why do they demand improvements and conditions that increase your expense for the production of milk, unless they are able and willing to supply a remedy, which is to give you more for your product.

Now, then, again, your cattle are worth more money if they are tuberculosis-free, so that I could continue pointing out where it is to your advantage to eradicate tuberculosis from your herd if they have it or to keep it out if they haven't got it. You all know that tuberculosis is a specific disease; therefore, it must be caused by a specific thing, and in this instance it is caused by a living organism, a micro-organism, and an organism that is not apparent under ordinary circumstances to the naked eye; but, nevertheless, it has to live and it has to eat, so to speak, to live. As a matter of fact, its habits are identical with the habits of a human being; I won't say identical, but they are somewhat similar, physiologically. Now, to have tuberculosis, you must have the seed of tuberculosis just as you must have the seed of a peach tree to develop peaches, to grow peaches or to grow a tree. You cannot have tuberculosis unless you have the specific cause of tuberculosis; Now remember that. Tuberculosis does not arise from filth or dirt or bad ventilation or unsanitary conditions of a barn; it cannot; it is impossible; you must have the seed of the disease.

Now, the question is, how are you going to get rid of this seed? How are you going to get rid of tuberculosis? The only one way is to detect the seed on your premises, in your cattle, and get rid of it. How are you going to do that? As I told you, this organism will grow and all it needs is the proper soil, all it needs is fertile soil. It is planted just the same as anything else; but it has got to have the soil to grow; if it does not have that soil, it won't grow and it won't develop. You can grow this organism outside of the animal body; you can grow it in a laboratory; you supply this seed with favorable food and put it in an incubator at the temperature of the body and leave it there, and these minute microscopic organisms grow and thrive and they practically eat up the food that you put there for them and the result is that they have waste products just the same as a human being has waste products.

Now these waste products are utilized in the detection of tuberculosis in cattle. These waste products, treated in various ways, which I will not go into, are what is known as tubercular; it is the product of the growth, the artificial growth, of the tubercle bacilli. Remember this organism is *grown*; you've got to get the organism. First, you have got to plant it in a media upon which it will feed,

upon which it will develop favorably, and then you can see these what were originally microscopic organisms, you can see them grow, because there are many millions of them in a flask of culture upon which these bugs are grown, and then they appreciate themselves, they get together collectively; but you cannot see one with your naked eye, you have got to use a microscope, and then they only appear as a very slight rod. Then we have this by-products of the growth, you might say, of these tuberculosis organisms, which is tuberculin. It is a well-known fact that tuberculin, when injected subcutaneously into a cow, is the best diagnostic agent we have for the detection of tuberculosis. Now you all know that a tuberculous cow, except when she is in an advanced stage of tuberculosis, does not go around with a sign on her that "I am tuberculous." It does not give you, under ordinary conditions, any notice that your cow has tuberculosis; but, nevertheless, she may, and she may be able to disseminate, to breathe out the seeds of this disease which, when taken up by another animal, that animal might develop the disease, depending, of course, upon certain physical conditions of the animal.

There is another way which has been advocated, of late, to a very great degree, as a sort of a way to suppress tuberculosis. But suppressing tuberculosis, in my mind, is not eradicating tuberculosis—and that is by a physical examination of the cow. All of you who have associated with cattle daily, I should say, are familiar with what symptoms a cow affected with tuberculosis in an advanced stage, should present. Many of you have no doubt put the cows in the field, the dogs have run the cattle, and you would see one cow hump up her bag a little and go "Hoo, hoo, hoo." You know that is a case of tuberculosis in that cow; you can't get away from that; you know it just as well as we do. You know that peculiar cough, that peculiar sound of the cough. You see the expression of the cow. You are better able to notice and appreciate that expression than a stranger, because you see that cow every day, or if not every day, occasionally, and you say to yourself, "There is something the matter with that cow; what is it?" That is a physical case of tuberculosis; you do not need a veterinarian to diagnose a case of that kind, you all diagnose them, yourselves. It is a common practice that when you see a cow come in, down like that as many have done in New York State, they call in the butcher and get \$15, \$18, \$20 for a cow like that and away it goes and it is lost sight of.

The CHAIRMAN: What becomes of it?

DR. GILL: I don't want to go on record, I don't know.

A Member: We didn't hear what the question was.

DR. GILL: The question was what do they do with cattle of that kind? I am sorry to say that in New York State we haven't any State Meat Inspection Law, so there are perhaps opportunities for cows of that kind to be killed in the country abattoirs or slaughter houses, and probably they use the good parts of the meat, I don't know, I don't believe they would use the diseased part. I want to say that it is a physical impossibility which has been demonstrated time and time again for any ordinary man, upon a physical diagnosis, to pick out all of the open cases of tuberculosis. When I say

open cases of tuberculosis, I mean cases where the lungs are affected with the disease, the result of the invasion of the tuberculosis organism and that communicates with the bronchiae and bronchial tubes and through the nose to the exterior and is capable of breathing out the organisms.

The CHAIRMAN: Is it possible for any one method to detect all of them, Doctor?

DR. GILL: Why, the tuberculin test comes the nearest and I think that it gets nearly all with a very few exceptions, but when there is an area in the lung, we will say, as large as that, located within the chest and in a part of the lung that is remote from the free surface of the ribs, it is almost impossible to get any sound that would indicate that the cow had that lesion at that, or in that remote part of the lungs, and many cases of tuberculosis that are generalized are in such a state with the nodules, little grape-like nodules, distributed all over the covering of the intestines and the lining of the abdominal cavity, the covering of the pleura, the chest and the heart sack, the pericardium just studded with tuberculosis nodules—those cases I have known to have been missed by the so-called physical diagnostician, so that you see that it is not a real, practical way of determining whether or not your cattle are affected with tuberculosis. If you find one acute case, it is safe to say that you have got more, there is no question about that, but I mean that it is impossible to pick out all of the spreaders.

Now, mind you, I am not speaking about all the cases, I say all the spreaders, all the cases where there are lesions in the lungs having a communication with the exterior. You know that cows do not expectorate. You know that they have an accumulation of mucus plus tubercular organisms in their throat, but instead of spitting, they swallow. They swallow their excrementitious matter from the throat and it might appear very funny to you for me to say that a cow with an open lesion in the lungs would spread the disease by spreading the organisms, but if you had seen, as I did at the University of Pennsylvania—I think Dr. Marshall will bear me out, and Dr. Pearson was there—some years ago they made a gauze mask, put those masks over non-tuberculous animals and tuberculous animals and allowed the animals to breathe through this gauze. Then they took the gauze to the laboratory and were surprised themselves; I think they found the organisms in nearly every instance, showing how the disease is disseminated, how quite possible it is for an animal to breathe out these organisms and if breathed in by a neighboring cow which is in a susceptible condition, that cow would be affected.

Now that brings up a point that always struck me from that time, and I have applied it practically, and that is to have good ventilation in a barn; not only good ventilation, but a constant disturbance of the air, a current of air just to overcome that possibility of the concentration of these exhaled organisms from an infected animal, so that the air will disseminate them and lessen the possibility of the other cows taking it.

I don't know whether you follow me in that statement or not, but there is ventilation and ventilation. You may have ventilation enough but no current of air. You may have what you think in

your stable are plenty of inlets and outlets and still they may not be arranged so as to create a current of air. You may have your air stagnant; but you raise your outlet 15 or 20 feet and it will take your hat up, there will be a great circulation of air; there is where the mistake is made.

Never be satisfied from a theoretical plan. I have seen theoretical plans followed absolutely and still you got no current of air or if there was any current it was in the opposite way to that from which we are expected to go. Apply your own good common sense, put another piece of stove pipe on your outlet, a piece 6 or 7 feet long, and you will be surprised to see the result, it changes the whole situation, creates a current, and that is what you want in a cow stable. You don't want to have your cows closely confined in an excellent stable; you may build the finest cement barn with good tight windows and a cold winter's night you come in there and the cows are nice and warm, but there around the windows and on the wall is a condensation of moisture which is an indication that that stable is very, very badly ventilated, and that is one of the causes, in my mind, one of the most potent factors in the contributory causes to the spread of tuberculosis, the confinement of the air in a barn.

Now that gets us back to the tuberculin test; that seems to be the bone of contention; it may be because it is more or less complicated. It may be because it required application, very close application of the operator, of the tester. It requires the cleanest sort of observation, so as to be able to determine just what caused a sudden elevation and dropping of the temperature during the process of testing. There is a cause for all those things. It may not be due to tuberculosis, but there is a cause for these irregular temperatures.

Now then, in the first place, we have got to get our tuberculin... as I spoke of, we have got to get good tuberculin and we have got to have fresh tuberculin. Mistakes have been made by using tuberculin that had deteriorated, that had been in a warm closet or a desk drawer or on the mantelpiece or in the barn for an indefinite period of time. Don't take any chances like that, because you cannot expect to get any results. Do not use any of your left-over tuberculin, get the fresh stuff. Upon the quality of that tuberculin depends an accurate result, and it means money to you if a mistake is made.

The next step is to see that the cow receives the dose intended. If you want to give a certain amount of tuberculin, you want to be sure the cow gets it. If you give just two-fifths of a cubic centimeter, which is a very small amount of tuberculin, it is almost an impossibility to get it all out of your needle, to get it all into the cow. Therefore it is well to dilute your crude tuberculin, to take two-fifths of a cubic centimeter of tuberculin and add enough water to make five cubic centimeters, and then if you lose any of it, it is an infinitesimal amount and will not affect the result at all; but if you inject two-fifths of a cubic centimeter of crude tuberculin and lose an infinitesimal amount of that, it does affect your dose unless you give a double dose.

The next thing is to inject the tuberculin into the cow with the least possible annoyance to the cow. How are you going to do that?

By using a small, sharp needle, and see that your needle is always sharp before introducing it into the cow. I have, in many instances, had my attention called by the cow itself to the fact that the needle was dull; I knew the needle was dull from the way the cow acted, and upon examination I found that was the case, and, therefore, used a new needle. So you want to have a good supply of real good, sharp, small needles, not a large needle, and you can go right along with very few exceptions, where you have fractious cows. Of course when you inject into a cow, she will pay no attention to you if she is familiar with you herself, or she will pay very little attention to you if you are dressed according to the habit of the barn, and it is a matter of very little work to inject.

The next thing to do is to have a good syringe, a syringe that don't kick, a syringe that don't leak, a syringe that has not laid on the shelf a long time and dried out, one that when you use a little pressure on the piston to force out the tuberculin, it don't kick back so that you can't tell how much you are giving. Now I should have mentioned before about taking the temperature before the injection. Of course you have got to take temperature and take them sufficiently long to determine the mean normal temperature of the animal, and you want to take temperatures at times of the day corresponding with the temperatures the next day so as to compare them and note any difference. If you should only take a night temperature before, we will say, and run along until the next night, you are not able to compare the temperature before and after at the same time, so it is always best to take the temperature in the morning, take the temperature at noon and take the temperature at the time of your injection; and if you can take it oftener than that, why so much the better.

Now the question comes, the most important part of the whole thing appears, and that is the after-temperatures, the temperatures following the injection of tuberculin. You know that if a cow is tubercular, you expect a rise in temperature; I am not going into the details or the technique of this, because I might get too deep in the bacteriological side of it, therefore I will keep out, myself. This tuberculin is injected into the cow for a certain reason. What is it? That reason is that that tuberculin is supposed, when injected into a cow affected with tuberculosis, to create a systemic disturbance of some sort. That disturbance is evident to a more or less degree by an elevation in temperature. Now I want to say right here that it does not make any difference to what degree that temperature goes, if it goes up at all, if it goes up a degree, there is some cause for it; and if you cannot find any other cause than tuberculosis, it is tuberculosis and you have got to figure that it is tuberculosis.

Now just how long do you expect it to be before you get a reaction? Well, I might qualify that by saying: How long would one expect before he gets the maximum elevation of temperature or reaches the height of the reaction, so to speak, because it's got to go up? It may surprise you to know that I have seen that at the twenty-fourth hour, and only the other day I noticed one the twenty-second hour. The temperatures were absolutely normal up to the eighteenth hour. The twentieth hour there was a little movement of the thermometer in an upward direction. It continued and we eighteenth hour. The twentieth hour there was a little movement

this to show you how essential it is to take the temperature at regular intervals from the moment of injection right straight through to the twenty-fourth hour, and then some more if you can.

Every owner of cattle, every herdsman should become familiar with the use and readings of a thermometer, and they should continue the temperature findings, to be absolutely certain, right along every two hours after injection, do it themselves if the veterinarian does not do it. The veterinarian must sleep, you know, but in the intervals you can take the temperature and I want to cite an instance that happened. I directed a veterinarian to test some cattle and he came back after taking the temperatures up to the eighteenth hour, or he telephoned me—that is the regular requirement in our State, up to the eighteenth hour. There were circumstances surrounding these cattle which were such that I wanted to be absolutely sure about it, and I wanted them taken up to the twenty-fourth hour, so that I had to ask the owner of the herd to take the temperatures himself. He was a good, practical man, had often bought cattle and made the test himself and was in position to judge whether the test was made right, and he did it and we got a generalized case on the twenty-second hour; the temperature began to rise the twenty-second hour; he took it the twenty-fourth and twenty-sixth hour and it stayed up about two hours and a half, and we slaughtered the cow and it was a case of generalized tuberculosis. I simply want to show you, but this illustration, that where an animal is saturated with tuberculosis and tubercular products, that it places that animal in an immune condition so that it offsets the fact of our injection, our ordinary injection of tuberculin.

Now those are the cases we might miss. And there was a cow that to all appearances was a perfectly healthy animal and she was in that herd, capable of spreading the disease. Now we will imagine that you have picked out all your reactors and you have gotten rid of them.

Now the next thing to do, and in my mind the hardest proposition, is to keep out the seed of tuberculosis. You must remember that you must liken this seed or this organism to any other seed or organism; it can be carried around, it can be carried by the wind, it can be carried by the manure, it can be carried by hogs, by chickens, by anything that moves or is moved which has come in contact with the specific cause of the disease. You have many instances of that in the agricultural line, as far as the moth is concerned, for example, and a few other of those vegetable parasites.

ADDRESS OF MR. STEVENSON.

You know I can't even get under way in five minutes. I have no desire to hold anybody against their will; but I think this question is of such importance to the breeders of cattle, that we ought to take a night, if necessary, in order to acquire any information about it

that we can. There is one thing to be said against the advocates of general tuberculin testing as now applied under the law—if it is a good thing and will accomplish the purpose of eradicating the disease or of keeping it out of our State, why not apply it to every herd in the State—get rid of all the reactors at once? Now, by not doing that, they admit that it will not accomplish what they claim for it, that it has absolutely failed to accomplish what they claim for it, and I am going to cite you one or two little cases, only, because of the limited time at my disposal. An institution in my county between January 1, 1913 and August, 1913, built a new, modern sanitary barn; lots of sunlight, twice as much as there would be in this building, bought in the adjoining county 97 cattle, subjected them to the tuberculin test by veterinarians of their own selections, one of them a relative of our State Veterinarian; not a reactor was found; all were pronounced sound. They were driven across the country about 80 miles, assembled in this new, modern sanitary barn, kept free from contact with any other cattle. There was no known method of known communication of the disease, and in April, 1914, they were again subjected to the tuberculin test by another veterinarian and 36 reactors were found. They were slaughtered and pronounced by the veterinarian, a very competent gentleman and, I think, thoroughly honest, as I think Dr. Marshall is thoroughly honest—found by him to show lesions of the disease. Four others, not reactors at any of the tests, these two prior test were slaughtered later and three of those were found with lesions of the disease. They were held until October—the remaining 57, again tested, and, gentlemen, there are 22 left. There won't be any left after the next test or two.

Now that is the method of eradicating tuberculosis, but you eradicate the herd and annihilate it when you do it. Dr. Moore had precisely the same experience reported in an article in the American Veterinary Review by Prof. Hastings with whom I had my first controversy in Hoard's Dairyman. Ninety seven animals were subjected to a semi-annual test for four years and out of the 97, 19 were left—a pretty good showing too.

Where are the cattle coming from? Where are you going to get your milk from? Where are you going to get your future dairy cattle, if you slaughter the animals that react? And a great many that react are found to be perfectly sound, found to show no lesion of the disease after reaction. I have right here in an envelope—if I had all night, I could give it all to you—a report from our State Veterinarian as to the animals tested—animals imported into the State of Pennsylvania and tested in 1914 at Pittsburgh, Lancaster and other places—27,000 animals, is my recollection, of which number 305 were found to be suspicious. That is a class that don't exist when they test our animals for interstate shipment; they are either reactors or non reactors, they are not suspicious. Three hundred and five were suspicious and of that 305, on the re-test, a large portion were found to be sound. Two hundred and sixty reactors were found and slaughtered. Fifty-three showed negative autopsies; 20% were sound according to the post-mortem examination.

I want to qualify that a little bit; I will admit that in our autopsy the veterinarian may not find physical evidences of the disease in the post mortem and yet the animal may have had the disease. A layman's knowledge don't go quite as far as that of some of these

pseudo scientists who use a microscope and so on. All honor to the fellow that is an honest investigator, as was Prof. Kopp, but I despise the man who is not an honest investigator and does not give us the actual results of his experiments—all the facts and factors that make them up; not his conclusions, as did Dr. Moore when he made the stockyards in Chicago and became offended at me when I made a contradiction because I did not publish his letter. I did not publish his letter because it had four flat contradictions in it. If the test did the business, we would all welcome it with open arms, as I did in my graded herd until I had proved that it was a failure. Animals tested in January were re-tested in May, when they said sufficient time had elapsed to give them a second test, and out of 12 animal reacting in January, only 8 of that 12 reacted in May. It is accurate? Were they sound or were they unsound? How are you going to tell? This we know—those that have been stamped as reactors and some of these gentlemen say ought to be branded, have gone into barns under the reacting of Bang's system, stayed there nine or ten or eleven or twelve years and it apparently perfect condition, performing all the functions of the dairy cow, four good quarters to a mighty good udder, making high official and semi-official records, producing a calf every year, and lived there till they were 16 and 18 years way past the ordinary age of the common dairy cow when she is discarded and goes to the scrap heap. That I have discovered in two reacting barns, one maintained by the State of Pennsylvania at Media, and I say we ought to demand, as citizens of Pennsylvania, a book, if it's as big as Webster's, the Encyclopedia Britannica or the Century Dictionary.

We ought to have a detailed report of everything that happened at Media. It rests with us; we can get it if we demand it, and the first appropriation that ought to be made to the Livestock Sanitary Board ought to be made for the purpose of giving us the facts they have been unearthed. I have a lot of respect for Dr. Gill, he has handled this thing in a very moderate, fine manner. If we could get all the veterinarians to apply the tuberculin test as I believe Dr. Gill would apply it and as I believe that Dr. Marshall in person would apply it, we would welcome it, but you cannot find them, they are not on the map. The editor of a leading dairy paper stated "I think, that we'd better call off this tuberculin test." There are a good many institutions turning out young men to take a squirt gun in one pocket and a bottle of tuberculin in the other and go around pretending to eradicate tuberculosis, but they don't eradicate it, that's the trouble. Prof. Hastings, a very fair, broad minded gentleman, with whom I had my first controversy, came back to me in a letter and said the tuberculin test is not 98% accurate, the most you can claim for it, in my experience, is about 86%. He says the Tuberculin Congress stated that tuberculin will not always cause a reaction when the disease is in incubation; when the disease is started, and, third, when the disease is extensively generalized. But that Tuberculin Congress did not add, what Prof. Hastings did, that it often condemns perfectly sound, healthy animals. I will admit that in that case the veterinary who made the test probably read the signs wrong. The veterinarian may mistake sometimes a rise in temperature due to another cause for a reaction; I think that has often been done and that Dr. Gill will agree with me on that proposition.

How are you going to eradicate it from your herd and have your tubercular-free herd if the disease is as easily communicated as Dr. Gill says—blown in on the atmosphere from your neighbor's pasture, blown into your barn or carried in by some person? How are you going to have your tubercular-free herd unless the tuberculin test is applied to everybody, and then, if you do that and pay for the slaughtered animal, old Pennsylvania will be in the bankrupt list and so will New York. This thing has cost us in Pennsylvania, in appropriations—I haven't been able to find out how the money was all spent—since 1895 when the first Act was introduced, about \$1,750,000 in appropriations to the State Livestock Sanitary Board. I make the assertion that we have derived no benefit in preventing the introduction of tuberculosis into the State of Pennsylvania from all our laws and all the appropriations spent by the Livestock Sanitary Board for that purpose, but we have given to a lot of honest breeders of pure bred cattle, a bad reputation, which we had no right to do. In place of attributing the reaction, when cattle are tested after arrival, to the true cause which in most instances is the acknowledged limitations of the test, they say that that man was a crook. I have heard the former President of the National Holstein Association, whom I believe to be just as honest a man as I claim to be—and by the way I claim to be just as honest a man as stands in the State of Pennsylvania, that's my own opinion of myself, you know—I think it is an outrage to state, because an animal reacts after shipment—and I never had such a case, I am not hurt yet, personally, every animal I shipped has pleased my customer and he has come back for more, there is one of them here now that came after a second one, and not one has given me any trouble, but I know that my experience will probably be that of other men, so I publish in the back of my catalogue, "Send your own veterinarian to make the test; you assume the moral responsibility for the incorrection and inaccuracy of it; don't take her if she reacts, but leave her on my premises and nobody is going to brand her, she is going to stay there as mine.

We have been humbugged as much by immature legislation on a subject we know so little about—I don't say that these veterinarians are humbugging us, I don't say that there isn't anything of truth in the discovery made by Kopp of this tuberculin lymph, because I am inclined to think that where all the care and judgment and intelligence so ably discussed by Dr. Gill and so very ably discussed by Prof. Hastings in a bulletin recently issued by the Wisconsin Experiment Station. I was glad to hear Dr. Gill, if I understood him correctly, state that this is purely now an economic question for the breeder himself, that the protection of the consumer of marketed milk is assured now by pastuerization; is that about right, Doctor?

REPORT OF MICROSCOPIST AND HYGIENIST

By PROF. JAMES W. KELLOGG

A report by your Microscopist and Hygienist to this body which would impart information on subject suggested by the title given your Specialist is called for and should be presented at this meeting. Because of the fact that other specialists of the Board are to speak on sanitation and allied subjects, and also because it has been impossible to devote special study to hygienic questions, it seems proper that a report should be made to you, gentlemen, covering the work of enforcing the new Seed Law in which we have been engaged during the past year. Because of the newness of this work, it is felt that a report showing what has been accomplished thus far would be of special interest, rather than to devote time to a subject which can be commented upon by others.

Pennsylvania's first Pure Seed Law was placed on the statute books as a result of the agitation on the part of members of the State Board of Agriculture, seed growers and officials of the Department of Agriculture, to improve the quality of seeds being sold and grown throughout the State. At the 1913 session of the Legislature, a bill was presented by Representative J. H. Wilson, which was passed and approved by the Governor, April 29, 1913, which became effective as a law, January 1, of the following year. The Secretary of Agriculture was charged with the enforcement of the law and the laboratory of the Department was accordingly called upon to perform the necessary duties under its provisions. Proper equipment was installed in the laboratory and the service of a competent expert employed to make tests for purity on the samples which were collected by special agents or which were sent in by residents of the State.

The Seed Law establishes standards of purity for 21 kinds of seeds and prohibits the presence in the same of dodder and Canada thistle in excess of one seed in 3,000. It imposes a penalty for selling any of the seeds stated in the law, which do not meet the standards of purity, provides for the collection and examination of samples and for the testing of special samples of seeds sent to the Department, making a charge for such tests of 25 cents each. These standards of purity range from 75% to 97% as follows:

Medium red clover,	Trifolium pratense,	97%
Mammoth red clover,	Trifolium pratense,	97%
Crimson clover,	Trifolium incarnatum,	97%
Alfalfa,	Medicago sativa,	97%
Timothy grass,	Phleum pratense,	97%
Barley,	Hordeum vulgare,	97%
Spelt,	Triticum aestivum Spelta,	97%
Wheat,	Triticum aestivum,	97%
Buckwheat,	Fagopyrum Fagopyrum,	97%
Oats,	Avena sativa,	97%

Rye,	Secale cereale,	97%
Alsike clover,	Trifolium hybridum,	95%
Perennial rye grass,	Lolium perenne,	95%
German millet,	Chaetochloa italica,	95%
Hungarian millet,	Chaetochloa italica,	95%
White clover,	Trifolium repens,	90%
Red Top grass,	Agrostis alba,	85%
(solid or hulled).		
Canadian blue grass,	Poa compressa,	75%
Orchard grass,	Dactylis glomerata,	75%
Kentucky blue grass,	Poa pratensis,	75%
Red Top (unhulled),	Agrostis alba,	75%

Dodder and Canada thistle are prohibited from being present in excess of 1 seed in 3,000.

In testing seeds for purity, a careful selection of samples is of the most importance in obtaining results which will correctly represent the quality of the stock of the seeds or of the shipment being examined. Your attention is, therefore, called to this matter in order that if any of the members of the Board desire to have seeds tested or to direct others in getting this information, special care can be taken in securing special samples. If the seed is in sacks, bags or other large containers, samples should be taken from several different places, thoroughly mixed and the following directions carefully followed:

AMOUNT OF SAMPLE: 2 to 4 ounces, carefully secured and representative of whole lot.

ENVELOPES: Should be used and carefully sealed.

ADDRESS: Bureau of Chemistry, Pennsylvania Department of Agriculture, Box R, Harrisburg, Pa. The name of seed and address of sender should be also included.

CHARGE FOR PURITY TEST: 25 cents is the fee charged and it should be submitted with sample in the form of a certified check, money order or cash. If cash is sent for one or two samples, it may be inserted in the sample of seed with safety, if the envelope is carefully sealed.

After the seed tests have been completed, reports are sent to the senders stating the name or kind of seed received, the percentage of pure seeds, foreign seeds and inert matter, the presence of freedom of dodder or Canada thistle, together with a receipt for the fee charged. The following explanation of what is meant by pure seed, foreign seed and inert matter will be of assistance in judging from the reports received the character of the samples examined:

PURE SEED: Consists of the seeds under examination only. If for example, red clover is being tested for purity, the percentage of "pure seed" represents the amount of red clover seed present by weight in a given quantity.

FOREIGN SEED: Includes the amount of all other seeds present which differ from the kind of seed under examination.

INERT MATTER: Includes all materials other than pure and foreign seeds, such as less than half parts of seeds, broken stems, dirt or any other foreign material.

During the year just closed 202 official samples of seeds were collected by special agents of the Department from dealers and seedsmen located in the State. These samples were all tested as required by the law and reports sent out to the parties from whom the samples were obtained. In addition to this there were 376 special samples sent to the Department for purity test by seed dealers and seed growers located in the State; thus taking advantage of the provision in the law for finding out whether seeds which were to be offered for sale would meet the established standards for purity.

The results of the seed tests made during the past year have been published in the form of a Bulletin, No. 258, which will be sent to any one desiring a copy, if they will kindly send their names to the office of the Bureau of Chemistry. This report shows the tests made on each sample of seed examined and goes into detail concerning the work. It will be unnecessary at this time to attempt to give this information. It will be of interest, however, to include in this report, a summary or an average of the purity of the official samples of seeds examined, as follows:

AVERAGE PURITY OF OFFICIAL SAMPLES

Name of Seed	Number of samples	Standard of purity	Pure seed	Foreign seed.	Inert matter
		Per ct.	Per ct.	Per ct.	Per ct.
Red clover,	73	97	98.9	0.7	0.4
Crimson clover,	7	97	98.5	0.5	1.0
Alfalfa,	20	97	99.6	0.1	0.3
Timothy grass,	33	97	99.1	0.5	0.4
Barley,	2	97	98.3	1.5	0.2
Buckwheat,	3	97	99.3	0.2	0.5
Oats,	4	97	98.8	0.3	0.9
Alsike clover,	30	95	96.5	2.8	0.7
Perennial rye grass,	3	95	95.9	2.2	1.9
German millet,	6	95	98.1	1.3	0.6
Hungarian millet,	3	95	97.5	1.7	0.8
White clover,	9	90	94.9	4.0	1.1
Red Top grass (hulled),	2	85	89.9	0.4	9.7
Orchard grass,	6	75	78.3	1.5	20.2
Kentucky blue grass,	1	75	82.3	0.5	17.2
Total,	202	.....	.....	.....	.....

It will be seen from the above figures that in every case the average test for each kind of seed was in excess of the standards of purity, and in only a few cases the actual test ran slightly under the required percentage.

It, no doubt, will be of interest also to learn something of the methods employed in testing seeds for purity. This work is rather tedious and takes considerable time and care, if accurate results are to be obtained. The methods which we use are essentially the same as those employed in the Seed Laboratory of the United States Department of Agriculture and other well equipped laboratories. Because of the lack of complete information on the subject, no standards for germination were included in the Seed Law and, therefore, germination tests are not made by the Department.

After the samples of seeds have been received in the laboratory, they are given a number and separately examined. The official samples collected by special agents are received in special seed envelopes and those samples which are sent in by dealers or seedsmen located in the State are placed in envelopes for this purpose and properly labeled and numbered. Each sample is thoroughly mixed and subdivided until the amount necessary for a test is obtained. A mixture of seeds cannot be uniformly mixed in the same manner as can material resembling flour, meal or mixed feeds, for the reason that heavier and smaller seeds have a tendency to separate from the lighter and larger ones, and, therefore, the portion of the sample to be tested must be secured in a manner to overcome this tendency of the seeds to become segregated and improperly mixed. A mixing and dividing apparatus is, therefore, used to obtain the proper results. It consists of a revolving funnel shaped hopper into which the whole sample is placed and by means of a set screw and disc to regulate the delivery of the seed, by revolving the hopper with the rotating crank, the sample is thoroughly and accurately mixed and delivered equally divided through V shaped delivery tubes into two receptacles. In this manner the sample is sub-divided until the required amount is secured which varies with the size and weight of the seeds under examination from 1 to 30 grams. This amount is carefully weighed on an analytical balance, all weights being recorded to the fourth decimal part of a gram.

The weighed portion of the sample is then separated into pure seed, foreign seed and inert matter by the aid of the eye or lenses and occasionally assisted by means of various sized sieves, as the case demands. In the case of small seeds where light chaffy material is present, and especially in the case of grasses, which contain chaff, pieces of stems, leaves and other foreign material, a preliminary separation is made which is effected by means of an electric blower. This apparatus consists of a long glass tube, one end being bent at right angles, the other end being covered by a fine meshed cloth, an air blast and a receiving jar. The weighed portion of the sample is placed in the glass tube resting on the cloth in one end, this end being inserted in the blast pipe and the other in the receiving jar.

The air blast is turned on the light chaffy and inert material is blown over into the receiving jar, the heavier portion of the sample remaining in the tube. The final separation is made by placing the divided portion thus obtained on a white paper-covered table, especially made for this purpose, and by means of the eye and lenses separated into pure seed, foreign seed and inert matter as in the case of samples which do not require the preliminary air blast separation. These portions are weighed and the percentage of each estimated.

If the presence of dodder or Canada thistle is noted or suspected, the complete sample is examined and the proportionate number of these seeds to the whole number of seeds is estimated.

If at any time any of the members of the Board desire information along this line of work, or any other work which is being done in the laboratory of the Department of Agriculture, we will be only too glad to give all the information which we possibly can. Our laboratory is always open for any of you gentlemen, and we shall be pleased to have you call and inspect the work of testing seeds for purity.

REPORT OF ENTOMOLOGIST

By PROF. H. A. SURFACE.

The year 1914 was marked by many peculiar entomological conditions worthy of record in the State of Pennsylvania. In the beginning of the year, if we had investigated all of the granaries and mills in the southeastern part of the State, we would have found a serious and extensive infestation of stored grains by the little pest known as the Angoumois grain moth, which, however, is one of the five or six different species of insects commonly, but wrongly, called the "weevil." Great loss has been experienced from this pest during the past year, and in fact more than ever before, chiefly because it is gradually reaching into new regions, and farmers at first do not recognize it as a very destructive pest, and, therefore, do not give it the attention that is necessary for its control. Tens of thousands of dollars worth of property have been destroyed by it. For example, we know a prominent farmer in Lancaster county at the present time selling his wheat for sixty cents per bushel to feed to chickens, because it is so badly infested with the larvae of the Angoumois grain moth; when were it not for this pest, he would receive about two and one half times that price. The means of prevention is to thresh the crop early, to get it out of the straw as soon as possible; and the remedy is to fumigate with carbon bisulphide by pouring this liquid over the grain in a closed bin, at the rate of one pound for each one hundred cubic feet of space occupied.

Early in the season came reports of canker worms defoliating the forest and fruit trees in the northern, central and western parts of the State. The wingless female ascends the tree from her winter abiding place, in a cocoon in the soil, and lays her eggs in irregular bands around the twigs, or in patches on the bark. She can be kept down by proper banding or by painting the trees with Tangle Foot preparation; but this must be done early before the frost is all out of the ground. The very young canker worms are easily destroyed by spraying with standard arsenate of lead formulae.

White grubs or "grub worms" (*Lachnosterna* larvae) were exceedingly abundant and destructive both early and late in the season. They became so destructive to lawns late in the fall as to destroy the grass entirely, causing it to burn brown, and cutting off the roots so that it could be rolled back like the sheared fleece of a sheep. There is an effective means of preventing damages by this pest, where ground can be cultivated, and that is to plow the ground in the fall, and run across it two or three times with a disk harrow set to cut deeply but not to scrape nor turn too much; or stir it deeply with a spring-toothed harrow. Cultivate it thus as late as possible in the fall and as early as possible in the spring, and postpone the planting until late. On a farm one of the best means of getting rid of the white grub is to turn the hogs into a sod field where the pests are found. Remove the rings from their noses and let them

root. Some persons will be surprised to see what an amount of soil they will turn up in a short time, and likewise what an immense number of white grubs will be destroyed by them. There is just one important point to bear in mind in this regard, and that is that a very seriously injurious spiny-headed intestinal worm has its alternating stage in the white grub as one of its hosts, and in the hog has another of its hosts. In other words, when hogs eat white grubs they are liable to become infested with seriously injurious internal parasitic worms. This only happens when the same ground is used for hog pasture each year or every other year. It is easy to avoid it by making sure that there is an interval of at least two years between the pasturing of hogs on the same ground. We are at present performing experiments for the extermination of this pest by the use of gases and poisons in lawns.

Cut worms were very bad early in the season, and took their toll from the crops of orchards and fields. They, too, can be prevented by late fall plowing and subsequent deep cultivation. The cut worm has a life cycle of but one year, while that of the white grub endures for three years. Cut worms are easily killed by poison bran mash. Fifty pounds of bran and ten pounds of shorts can be mixed with one-half pound of Paris green or dry arsenate of lead, and enough old strong molasses added to give it an odor, with enough water to dampen it slightly and make it cohere. Someone has suggested the addition of two or three grated lemons to give an odor to attract the pests, and experiments have proven this addition to be successful, although we know where some of our German farmer friends in Lancaster county successfully treated entire corn fields for cut worms without the addition of grated lemons or oranges. This poison mash should be scattered over the ground just as thinly as possible. Ten pounds will prove to be enough to kill the cut worms on an acre if spread thin, but there is no objection to the use of more. A very important point is that if scattered quite thin over the ground and broken up into small masses, it will not kill domesticated fowls or birds, even if they should eat it, as there will not be enough poison in a small quantity such as they might take, to affect them. Two Lancaster county farmers who followed our directions in doing this, reported that they cleaned their corn fields of cut worms, while others replanted the second or even the third time. By a small pinch of this at the foot of each young tree the climbing cut worms can be killed, and by scattering it where young plants, such as cabbage plants, are set the cut worms are destroyed. We have killed as high as nine cut worms around one cabbage plant in one night, finding them dead in the morning.

The most serious and conspicuous outbreak of pests on lawns of this State was by the Army worm (*Lucania unipuncta*). This is a species of cut worm which is present every year, but does not always increase to such numbers as to "march" or move from one feeding place to another, and then receive the common name of "Army worm." Its damage was terrific to the lawns and gardens in nearly all parts of Pennsylvania, eating away the grass in a single night, until what was a beautiful lawn during the previous evening was but a brown bare patch of ground the next morning. The inspectors of the Bureau of Zoology were early on the job, and showed how to control this pest by spraying with arsenate of lead or Paris green,

according to the standard formula. It was readily proven that it was not necessary to go to the trouble of digging ditches and pitfalls, or other contrivances, to destroy the army worm. Spraying was satisfactory in results for those who watched and did it in time.

The most remarkable piece of practical work in economic entomology during the year, was the successful artificial introduction of the enemies of the San Jose scale, now commonly known as the scale parasites, into scale-infested orchards in certain parts of Pennsylvania, as well as in other states. The natural way of suppressing all pests is by their parasites, and the Economic Zoologist succeeded in finding the parasites in great numbers and in rearing and disseminating them, so that they were effective in destroying the scale in orchards to which they were thus introduced. As a result, trees which previously bore fruit entirely unfit to be seen or used, produced this past season as fine fruit as was ever grown anywhere. There are specific cases where such fruit was borne on trees that had previously been infested with San Jose scale, but never had been sprayed for this pest, and which were cleaned up entirely and solely by the parasites.

An account of this successful introduction of parasites was presented recently by the writer to the American Association of Economic Entomologists, meeting with the American Association for the Advancement of Science, at Philadelphia, and from the scores of professional entomologists assembled, there was no dissenting nor criticizing word.

The following is an example of many reports that have been received, stating the results of this beneficial distribution of scale parasites: Within the past few days different states and countries, even as far away as Australia, have made requests for shipments of parasites in the hope of suppressing the San Jose scale in their orchards as effectively as they have done in those of Pennsylvania. When this subject was first mentioned a few years ago, it was thought to be a hoax, but it now proves the cause of the disappearance of the San Jose scale over vast areas, embracing several counties in Pennsylvania. But to the brief time of but fifteen minutes allotted to us for this report, mention of certain other important pests can not here be made, but we should not close without reference to the pests of the household and livestock.

It appears that the roach bug or Croton bug frequently occurs in houses and is quite annoying. A Franklin county correspondent wrote to us that he was having indescribable trouble with this pest. I recommend dusting fresh powdered borax in abundance around the floors and cracks, and especially pumps and sinks, in the pantry, on shelves, etc. He tried this, and within a few days replied that the effect was as if magical. He could see many dead roach bugs, but no live ones were left.

Pigs often remain thin and stunted, the hair becomes long, and ears droop, the animals loose appetite, are inactive, and spend much of the time rubbing themselves, and finally may get the "thumps" and die. A careful examination would reveal great numbers of hog lice on them, which could have been killed by the application of equal parts of kerosene and grease, such as old lard. Insect pests and mites in poultry houses have been destroyed by spraying thor-

oughly with the boiled lime-sulfur solution. More and more this material is coming to be recognized as the greatest insecticide and fungicide, as well as germicide, that has ever come to mankind. It is to the credit of the State of Pennsylvania that we faithfully stood by our convictions in the early recommendations of this material, until now, without exception, every state in the Union, and every civilized country on the face of the earth has come to recognize it and recommend it as the best material to use for destroying pests, whether they be insects or diseases of trees, or the insect pests and disease germs of poultry or livestock, where they can be met by spraying or washing the surroundings with any solution.

REPORT OF ORNITHOLOGIST

By DR. JOSEPH KALBFUS

Through some misunderstanding and entirely without my knowledge or consent, it appears I have been appointed to a position upon the State Board of Agriculture, that I am entirely unfitted to fill; and while I may know something about the habits of birds and the benefit of their life-work, I am not an ornithologist, and should not be placed in a position wherein I am expected to teach what I do not know. And I herewith most respectfully request that another be selected to fill this place. I surrender unconditionally.

In my journey through life, I have, to a limited extent, observed the actions of birds around me. In early life it was my privilege to cross the plains of Kansas, Colorado, Nebraska, and the territory north of these points, along the Rocky Mountains, and to there witness the lighting of untold myriads of grasshoppers on vegetation, to the absolute destruction of every growing thing. I have seen the army of birds, including many families and species, at work feeding on grasshoppers and know what the birds can do.

One of the great mistakes made by the majority of our people regarding birds is that they apparently do not understand that each family, and frequently each species of birds, has its special work to perform, and that while at times perhaps the majority of the feathered tribes may feed upon particular and abundant insects, the most of our birds have a special liking for some peculiar line of food, and confine themselves to this particular food as long as possible.

We have in Pennsylvania six kinds of common woodpeckers, each kind feeding in the place peculiar to its species. The flicker, one of the largest of this family, is the most terrestrial of the family and takes the most of its food upon the ground. The majority of the food taken by this bird during his stay with us is composed of ants. The ant is the greatest protector of plant lice or aphids, insects that are said to produce their young alive. The ant is said to carry these

creatures, that are almost incapable of locomotion, below the frost line in the fall, to carry them out in the springtime, and to place them on growing things, where they can secure needed nourishment, the ant getting from the aphid an excretion known as honey dew. Just as the farmer keeps his herds, his cattle, his sheep, his pigs, for profit, so the ant keeps and cares for and defends its army of honey dew producers. Along comes the flicker and destroys the ant, with the result that the aphid having lost its protector, or caretaker, falls a ready victim to some of its man enemies, or dies of starvation. No farmer can afford to have a flicker killed on his property.

Again, the cuckoo, one of our shy birds, one that builds its nest in thickets and moves about so quietly as to be but seldom seen by men, and the oriole, that builds its nest in the open, attaching its hanging house to the tip of the most delicate swaying branch of the elm, by the roadside, or near our homes, constantly in view and singing almost continuously during daylight hours, have the same food preferences. These two birds, of apparently widely diverging dispositions, are the only two birds in this State that make a specialty of destroying hairy caterpillars, of which the caterpillars of the brown-tailed moth are a striking example. They seem to have been intended by the great Creator to do a work for you that but few birds try to do, or could do, if they did try.

Audubon, writing of this disposition of these two birds long ago said, that an examination of the stomach of either the cuckoo or the oriole, during the summertime will show same to be lined with hair. And this was so; but the hair in the stomach of these birds was not a growth of the stomach, but, instead, was the hair of the caterpillar that had fastened itself in the lining of the stomach of the bird and remained there until dissolving by the juices of the stomach. You get a splinter into your flesh, and soon there is inflammation, followed by suppuration. Nature is trying to throw out the offensive substance and unless this is done, there may be serious trouble. One hair in the lining of the stomach or in the stomach of the great majority of birds would surely cause trouble, and many hairs, so affixed, would undoubtedly lead to serious trouble, perhaps death.

These two birds appear to have been created to do a special work for you, that other birds cannot do, and it is just so with all our birds; some on the ground, some on the trunks of trees, some in the branches, some feeding on insects found in one part of a tree, some on another kind of tree, some in the air, some in the water, but each family and species, no difference where found, having a specialty, and doing a work for you that no other bird tries to do. And just as the community in which you live is prosperous because of many men doing many things, so the bird world means much or little because of the presence in reasonable numbers of a variety of birds, rather than a large number of any species of bird, each one doing its own particular work.

When the farmer and his wife, his sons and his daughters, understand what the birds are doing for them and see to it that birds are accorded that protection they deserve around their premises; when houses are put up for the bluebird and the wren and the nuthatch, and such other birds as will live in houses; when birds are fed during the wintertime as they need to be and should be; then, indeed, will the dawn of a better day be at hand, and we can well say, figuratively

speaking, "The winter is over and gone and the voice of the turtle is heard in the land."

As an illustration, read what Edward Howe Forbush, the leading Economic Ornithologist of New England, if not of the world, reports under date of August 10, 1914:

"I have been looking over the destructive work of the army worm in this State. While the worms have been quite destructive in Wareham, Massachusetts, they have done no harm at all on my farm. In fact, you would never know from the appearance of vegetation that there was a worm on the place. I have taken extra pains this year to attract the birds, and they have eaten a great many of worms. Thirty or forty rods away from my place, the worms are beginning to be destructive, and in other parts of the town they have done a good deal of harm. They have done no appreciable injury on other farms where I have put up nesting-boxes in quantities. In Martha's Vineyard, the army-worms have cut corn crops to the ground. It is rather significant that the worms have done the most harm where poisons have been used to check them. Where no poison has been used, and where the birds have been attracted, the worms (although very numerous) have not done very much harm. On the State reservation, where the Heath hen has been protected, and where a great many nesting-boxes were put up this year, birds were very plentiful, as the boxes were nearly all occupied, and they were feeding on the army worm in large numbers. Recently I saw here quite a number of Heath hens apparently feeding on the army worm. Where poisoned bran was used in trenches to kill the worms on a large estate formerly owned by Professor Shaler, very few birds were seen, and we had several reports that dead birds had been found along the trenches, but I got there about a week too late and did not see any personally. I hear that a good many blackbirds and robins have been poisoned and that quail have disappeared where the poison has been used."

Quail are among the few birds that destroy potato bugs, and for this reason alone their presence should be encouraged on every farm. In addition to this, they undoubtedly destroy untold numbers of other insects and vast quantities of weed seeds, and will surely make a full return to the farmer who may scatter feed for them during that time when the world is covered with ice and snow, when poor Bobwhite and his family are suffering from hunger and about to die of starvation. A little grain placed where these poor dying birds can get it will mean more to them than the expressions of sympathy that could be extended to them by all the people of the county in which they are located. Put yourself in their place and think of what cold and hunger would mean to you. A piece of suet or tallow, or a shin-bone of a freshly killed beef, fastened to the trees around your home or in the orchard will surely be appreciated by the hairy and downy woodpeckers, commonly known as sapsuckers, whose specialty is the destruction of the codling moth, and the chickadees, and nuthatches, and other winter birds, that, through the destruction of harmful insects and their larvae, overlooked by the summer birds, will repay many times over any outlay of either time or money you may make in this direction. I know but little about the structure of birds, or how many feathers each species may have in its wing; but do know our wild birds are necessary to your happiness and success as farmers in Pennsylvania, and I beg of you to help the birds to help you.

Ornithologists, for reason of better understanding and study, divide the wild bird world into orders, families, genii, species, and sub-species, etc. One of the orders is known as "Raptores," and in-

cludes all predatory birds that wear feathers. The lifework of some these birds belonging to this order is considered to be beneficial while the lifework of other is decidedly injurious. When a Goshawk or a cooper's hawk or a sharp-shinned hawk even threaten to strike your poultry, you are out after him at once with a gun as you have a right to do and should do. The fact that one of these birds lives in your neighborhood means possible death to many of your fowls and loss to you. The death of the birds means safety to the entire brood, and profit to you. And my idea is, that this unfixed, varying thing, covered by the word "profit," is what most farmers are trying to secure. City folk, of course, have no such countryfied ideas. They are above that; they are actuated by other motives. To my mind there are various birds described by ornithologists, and then some, and I am fully satisfied that many of our real predatory birds are entirely without feathers, and that many of them live and roost in cities, each one of which is to my mind far more injurious to the interests of the man who labors on the farm with his hands than all the order of birds wearing feathers that may come upon his property, and classed by ornithologists as "Raptores."

I shall not attempt to enter into a consideration of the numerous and varied happenings that lead me to this conclusion, and shall consider but one line of many that I know of, by way of illustration: The dairy interests of the Commonwealth, in the aggregate, amount to considerable and the cost of maintaining a dairy is no small charge upon the farmer. You own your cattle; you paid for the land upon which they graze; you paid for the lumber, etc., used in the construction of the buildings in which they are housed. You labor early and late to supply the food for the maintenance of your herds, you milk the cows, you do such other things as may be needed to keep your cattle in condition, and send that milk or its product to the markets, through the middleman. Milk lost through souring or from any other cause is your loss. It is estimated that it requires the product from at least three cows to keep one cow. It is also asserted that not more than one cow in three really makes a return of "profit" to its keepers. It is up to every farmer to save at every turn, to be able to make both ends meet. He skimps and twists, wears old clothes, goes to bed at dark so as to save the cost of oil, in some instances eats what he could not sell, and is forced to place his product that he may have for sale in the hands of the unclassified bird from the city, whose sole object is, as he tells you, to help the farmer.

This bird, and his fellow birds, form a company, and call it a Creamery Company. Your milk is tested at these places, and you are paid the minimum market price according to the presence of butterfat as shown by the test applied at that place. I know of a man who has been collecting data regarding this matter for some time. Upon one occasion the milk from one cow, taken at the same milking and well mixed, was divided into two parts, each part as tested at this creamery, and showed a marked difference between the two tests. At another time the morning's milk, after being thoroughly mixed showed, as tested at the creamery, a certain mark. The evening's milk treated in the same way showed a certain mark, while portions taken from the same milkings and cans and sent to a Philadelphia chemist, one of the best testers of milk in this State, showed the morning's milk at the creamery, and the evening milk to have been

seven-tenths above the creamery tests. The uniform test for the two milkings was eighth-tenth above that given at the creamery, the Philadelphia chemist saying in his report that the milk presented to him from this dairy was the most uniform presented for examination for some time.

Again, I myself took occasion to visit this creamery in question and saw men bring in a can, one-half or three-fourths full of milk, and take away full cans of skim milk, not counting the froth, for I saw these men dip off the froth with their hands, so that the can might contain more good solid skim milk. I know that many men who bring no milk at all to this creamery carry away buckets and cans of skim milk. In this interest I visited State College, and talked at other points in the State with various chemists in an effort to be absolutely right in this matter and from what I hear I am led to believe that sulphuric acid being exposed to the air for some time, deteriorates from one cause or another, and cannot bring the result desired or expected by the man who has milk to sell. One young gentleman, a student at State College, told me, in attempting to carry on his work during the college vacations, he had to visit six or seven drug stores in a certain county before he was able to secure "clean sulphuric acid" such as he knew he must have to get the correct re-action. When I asked him what he meant, he said, "Acid to bring the true re-action must be pure, and if pure will be as clear as water. Many of the preparations offered me were smoky, really opaque." Investigation along that line convince me that this idea is correct, that tests made through the use of acid not up to the standard is simply guess work, and a farce.

I know of several instances where milk that would have gone to this creamery became sour, and was churned by the farm people. The return secured in butter being considerably above the return that would have come had the butter-fat been separated at the creamery. I know about the claims made by creamery managers regarding the weight of water and salt, etc., in the butter, as compared with butter-fat alone, but "am from Missouri" and cannot see where any harm would come to creameries, or to farmers, if a sufficient number of men was added to the working force of the Dairy and Food Commission of Pennsylvania to enable them to have inspected in all ways the various creameries of this State. If a farmer happens to water his milk instead of his cow, he will most likely get into trouble, and I believe the producer of dairy products is just as much entitled to protection as is the consumer of such products. Again, I believe it would be well to compel every creamery in this Commonwealth to establish and maintain a system of mechanical devices through which the farmer would have returned to him every pint of skim milk belonging to him. This means "profit," it is his right, and is a question entirely outside of the price he may secure for his milk. It seems to me that the time has come when every milk producer in this Commonwealth should take down his gun and go after the unclassified predatory bird. I thank you.

REPORT OF METEOROLOGIST

By PROF. WM. G. OWENS.

The relation of meteorology to agriculture is the subject upon which I have been asked to speak. Meteorology is defined as "that department of natural philosophy that treats of the phenomenon of the atmosphere, especially those that relate to the weather and climate, their relations to each other and the laws to which they are subject." It would seem at first glance, that farming had nothing to do with these subjects; but a closer inspection will make it evident that the weather and climate control the precipitation and drought, and frost being determining factors upon every farm. The subject has been broadened by use, and in the government meteorological reports, I find discussed such subjects as "Domestic Water Supply;" "Hard Water and Cooking;" "County Pollution of Wells;" "Sewage and the Farm;" "Deforesting the Cause of Floods;" "Period of Plant Growth," and kindred subjects. This opens a field which is of vital importance to the farmer. Both the State and Federal governments have established observation stations within their territories where systematic records are kept and sent to the head office. These data are systematized and the results can be obtained.

There are two classes of reports; one by paid observers which are telegraphed daily to headquarters, giving the direction of the wind, temperature precipitations, barometric pressure, and any other phenomena which would help the head office to determine the movement of storms, frosts and floods. Weather charts, maps and warnings, are sent out daily to those districts most nearly affected so that the farmer and shipper can take care of his products and get them to market in the best condition. These warnings, of course, affect some classes of farmers more than others, as there are some crops which can be protected from frost or other misfortune and thus saved. Some of these warnings are said to have saved hundred of thousand of dollars in some districts.

The other class of observers are the voluntary, or, as they are now called, co-operative observers. These get no remuneration and make daily observations which are sent in duplicate to State headquarters, and they send one copy to Washington. These observations include maximum and minimum temperature and the temperature at the time of observation; amount of rain or snow in the last 24 hours; amount of snow on ground at sunset; direction of the wind, character of the day, time of killing frosts, thunder storms, halos—solar or lunar, etc. Just lately the Pennsylvania observers have been asked to report especially the forms of halos and to note the angles and appearances of sundogs, etc. I was also asked to include earthquakes and tremors, but as I have not noticed any in the last twenty or twenty-five years during which I have been observing, I do not think that will be difficult. All these observations by hundreds of stations are made to learn, if possible, the laws as well as to make possible the forecasting of the weather.

By following the weather forecasts in the daily papers, we all notice how often they miss it. But it is claimed that they are right about 90% of the time. Most people would question this figure; but I think if you will follow up the matter you will find that the failures generally occur when the prediction is "local showers" or something of that kind. That means that there will be many showers over a very limited area, and of course in the same area there will be many places where it does not rain. Here is one place where the farmer can increase his information and can predict the weather more successfully than the weather man. When there are general storm conditions extending over large areas, then uniform weather prevails. It may be clear or it may be rainy; but where local conditions prevail, mountains and river valleys, direction of wind and other circumstances will determine whether there will be rain or frost in a certain locality. By long observation and the keeping of careful records, the individual can often forecast more accurately for his locality than a person not acquainted with local conditions. It may be that weather conditions are repeated from season to season or by cycles of years. During last year I heard of two New England institutions that wished to hold out-of-door celebrations. They looked up the weather for a number of past years and found that there were certain weeks when it was generally fair. They picked out one of these periods and in both cases they had good weather.

Now I do not wish to leave the impression that I think it would be possible to always determine when there would be sunshine; but there may be times when the weather is more likely to be fair in your community than at others. If there are such times, would it not be possible, in this age of plant breeding, to have crops ripen at such a time that good weather might be expected?

How can the farmers care for the water after it has reached the farm. There are two uses for water on the ordinary farm: That which is used for the animals and that which is used by the plants. These subjects are often discussed by the meteorological writers. The farmer often fails to give these subjects sufficient attention; Generally, I think, because he has not studied the subject. We all know that a great amount of water is necessary for the growth of plants. In Pennsylvania about 40 to 45 inches of water falls annually. This is more than enough to raise any crop that we plant, yet we often have poor crops for lack of moisture. By studying the influence of trees on certain parts of his farm, he might be able to plant them in such localities that they would hold the snow, prevent the winds from uncovering the fields and sometimes even removing the soil, and in other ways help hold the moisture till needed by the crop. Plowing in fall or spring is often a determining factor, depending on the lay of the land and the character of the soil. Knowing the time at which the precipitation is likely to occur, there is no one who should be so well prepared to know how the soil should be handled as the intelligent farmer.

Another point is the drainage. What kind of water is the farmer passing on to his neighbor or, if he is a careful man, what kind of drainage is his neighbor passing on to him. As we heard last night, if the farm above him has tubercular cows, the creek which runs through his farm will certainly be contaminated; and we all know what that means for his herd of cattle. But more important still is

the water used at the house. Too many dug wells stand in the doorway where the kitchen slops are often thrown, only to ferment and multiply disease germs which are carried into the well. Cesspools are often located near the well or on a more elevated position so that the drainage runs toward the well. In the limestone regions there are usually fissures through the rocks where the water can flow without being filtered through sand or soil. This is a fruitful source of contamination. As the country becomes more thickly populated and as our wells are used for a longer time, the drinking water is apt to become more and more exposed to contamination, and the time may not be far distant, in some localities, and may have already come in some places, where all drinking water should be boiled.

REPORT OF APIARIST

By H. C. KLINGER.

The year 1914 will go down in agricultural history as a failure in honey production. A few sections in the south and west report a fair crop. Bees wintered well and came out of their winter quarters strong and ready for a good harvest. Prospects for a good crop were bright but did not materialize. The earlier blossoms, such as fruit bloom and locust, yielded nectar as usual; but when the clovers came into bloom a sudden drought set in and continued until the blossoms were too far gone to be helped by the return of rain. The honey carried into the hives during the early spring was consumed in brood rearing and bees lived from "hand to mouth" until late in the season. In many sections of the State fall flowers, such as the asters and golden rods, were more abundant than usual, and if it had not been for these plants, many beekeepers would have been compelled to feed sugar for winter stores.

Peculiar as it may seem, the manufacturers of supplies did a good business. The great record bearing crop of 1913 cleaned up all the supplies on hand and the earlier prospects created a demand for supplies never known before. The majority of beekeepers have a stock of goods on hand to last for another season. National legislation, which affected bee-keeping during the year, has been the operation of the net weight law. This has produced some inconvenience and has augmented the tendency to change from producing comb honey to that of extracted. This, in conjunction with the effect of the European War will cause extracted honey particularly, to become lower in price. South American and West Indian honey, which formerly went to European markets, is now being dumped on our shores and competes with our extract honey. Bee-keepers should continue to produce comb honey since it is the finer product and commands a better price.

The year 1914 has seen the installation of another school of agriculture in the United States—that of the State of Minnesota. This school has an annual appropriation of \$5,000, and is separate from every other department of education. There are a number of similar schools and others giving departmental instruction in agriculture now in different states. Iowa, Oklahoma, Texas and Massachusetts each have State agricultural instruction, and the Dominion of Canada has a school at Guelph, Ontario.

What of the Keystone State? A practice not entirely new, but novel in its experience, has been more extensively carried on during the past year than ever before—that of migratory bee-keeping. A number of Northern bee-keepers sent their bees to the South last winter and brought them back again at the beginning of the Northern honey flow, thus practically making them work all the year round. The A. I. Root Company, of Ohio, sent a carload of bees to Florida in November, 1913, and brought them back last June. The shipment to Florida was one car of 300 colonies. The return shipment consisted of three and one-half cars of bees. The result of the experiment was an increase from 300 to 650 colonies and 460 three frame nuclei besides 13,000 pounds of tupelo honey and the drawing out of 6,000 additional frames of foundation into nice combs. During this last fall two carloads were sent to the Dismal Swamp, in Virginia, in which the honey bearing flora is similar to that of Florida, and the season nearly the same. The result of this second venture is anxiously awaited by all practical bee-men. Another company, of Canton, Ohio, sent a carload to Appalachicola, Florida, in the fall and to-day they advertise two carloads of increase for sale.

The work of inspection of foul brood diseases has been carried on with success, considering the limited funds at command. The work is limited to the expenditure of \$500 per year. This is inadequate. Repeated calls have come in from various sections of the State asking for inspection, but these had to be turned down because there were no means at hand to send any one. If the fight of this dreadful disease is to be carried on with any measure of success it will be necessary to have an appropriation sufficiently large to employ several competent men during the working season until the entire State is covered by inspection and the disease is under control.

The value of bees to the farmer and fruit grower is coming more and more into proper recognition. The once-held idea that bees were an injury to blossoms and fruit is thoroughly exploded and no longer held by intelligent persons. It is not only evident that bees are important to the fertilization of fruit, but it is now generally admitted that they are indispensable in the development of perfect fruit. In the summary of an address delivered before the Massachusetts Fruit Growers' Association, by the Assistant Pomologist, Prof. W. W. Chenoweth, is the following:

“1. All tests and observations agree that many varieties of fruit are unable to set a crop of fruit when limited to their own pollen.

2. Some varieties are partially self-sterile and a few wholly self-sterile.

3. All investigators agree, that as a rule, the fruit resulting from crossing, even in self-sterile varieties, is larger and better developed than self-fertilized fruit. Foreign pollen furnishes greater stimulus to growth.

4. All evidence at hand contradicts the theory that wind renders any dependable assistance in cross-pollination among orchard fruits, while it does emphasize the importance of the honey bee as an agent in rendering this great service to the fruit grower.

5. It has been shown beyond dispute that spraying open blossoms with arsenical poisons is injurious to bees. Also one runs the risk of injuring the unfertilized open flowers, in addition to leaving thousands of poison cups which kill the goose which lays golden eggs."

At first and for many years the idea prevailed that bees were inimical to the fruit grower; then came the time when it was realized that the bee-keepers' and the fruit-growers' interests were mutual; now it is proven beyond the adventure of doubt, that bees are absolutely necessary for perfect pollination of certain kinds of fruit particularly that of the apple. The famous Repp Brothers of New Jersey, with 800 acres of fruit, say they would as soon dispense with spraying as with bees, and if they even fail to secure any honey, they claim they pay for themselves many times over. Lastly, reports have been made from different sections that bees were poisoned and in some cases whole apiaries wiped out by injudicious spraying. Notwithstanding the teaching of years, there are yet individuals so extremely ignorant and foolish as to spray trees while in bloom. Teach it. Speak it from the housetops. Cry it out in the streets. Get it into the heads of the unlearned, that **NOTHING IS GAINED** by spraying while trees are in bloom. A definite and emphatic law should be passed to stop this pernicious practice.

REPORT OF AGRICULTURAL GEOLOGIST

By W. H. STOUT

As the time approached to prepare a topic for this meeting, I formulated in my mind, and later made notes until I had prepared what was intended to pass into history as a brilliant classic on the past and present of Agriculture. Upon receiving notice that the time assigned me, about 15 minutes, from 11.45 A. M., when everybody is hungry and getting ready for dinner, I had to revise, condense, reconstruct and abbreviate until little remains but a disjointed part, after cutting out so much. Some may even think it might have all been cut out except the title.

Jdgs. 12,5: Ephraimites could not pronounce like the men of Gilead, so there were slain 42,000.

Just what to offer on an occasion like the present without repeating what has been said before, taxes one's mind, and to present it in an acceptable manner before an intelligent audience like the one assembled here is no easy task. Sometimes listeners are over sensitive and critical which adds to the embarrassment. It is not considered good taste nor *genteel* to use the personal pronoun in writing

or speaking. However, personal experience and knowledge obtained in the pursuit of a calling or occupation should be of more value than that absorbed from others at second hand, or from theory. If it happens that the personal pronoun appears in this paper, it is not with a design of vanity or egotism. Depending upon one's own resources after graduating from our early common schools, after seven three months' terms, afford little mental training and a poor equipment with which to meet the struggle for an existence or a place in the Sun during three score years plus ten and four.

Knowledge is power and a foundation upon which to build is a valuable asset if the building is not neglected after the foundation is laid. Reflecting upon all the dangers passed through during the time allotted us in Scripture, it makes one shudder to think of the dangers of the measles, whooping cough and more fatal afflictions, including earthquakes, reptiles, bacteria germs, flies and mosquitoes. It is quite surprising that any remain to tell the tale after eating and drinking flies so many times. It seems necessary to pinch one's anatomy to find whether or not the spirit and the flesh have not parted. We have been told before now all about the independence of farm life, the ease and comfort enjoyed; swinging in hammock under the blossoming apple tree, where the bees hum in happy contentment, where the birds chirp and the butterflies in gaudy colors flit to and fro sipping nectar from the fragrant blossoms; how the auto speeds to the seashore or the yacht sails us over the briny deep; how the office seekers love us before the election and "cuss" us afterwards; how the banks are overflowing with deposits and money lenders standing on street corners offering loans on first mortgages to 50% of the value of property, then hypothecate the bonds with the U. S. Treasurer, getting currency for the same to loan to the people, getting the interest from mortgages on one hand and the discount from borrowers on the other hand.

Forty years steady practice in redeeming an exhausted farm to a productive condition and more than fifty years observation at various times while traveling over Pennsylvania, New Jersey, Delaware, Maryland and a little in other states has taught me some things useful. From ocean level to more than 2,000 feet elevation in various directions, from the hot sands of the sea coast to the cool breezes of the high plateaus, evidence climatic differences according to elevation and the variations of soils indicate the best suited locations for various crops. Trending northeast and southwest, the mountain ranges, hills and valleys run parallel, forming long stretches of the same soil. From the present time to the long past there are more than forty distinct deposits of clay, sandstone, shale, limestone, conglomerate, muck, peat, glacial and volcanic deposits, each differing from the others in texture, and fineness from solid rocks to particles of dust. These contain some eighty known elements of which, however, a few are of importance in agriculture, only seven always essential for crop production being, nitrogen, phosphoric acid, potash, lime, iron, sulphur and magnesia. The latter is contained in some lime and is regarded as injurious to plants if used too freely.

The problem of soil fertility is confronting farmers in many of the older states and is becoming manifest also in the Western and Northwestern States where the soil was once considered inexhaustible;

where, not long ago, manure and straw were considered as an encumbrance. it is now found a valuable asset. Even commercial fertilizers are found useful. Nearly all the states use more or less commercial fertilizer, and the entire country, as shown by the latest statistics, uses to the value of \$137,360,000 worth in one year. Pennsylvania reports 340,000 tons used in 1913, which, if valued at \$20 per ton, amounts to \$6,800,000. It costs the farmers about half the value of the potato crop, at fifty cents a bushel, or the value of all the apples for the fertilizer used. Adding to the fertilizer account the cost of manure and lime increase the expense very materially to maintain the fertility of the soil which naturally reflects upon the high cost of living. To transport the fertilizer used in this State, in 1913, required 34,000 cars of 20 tons each, and the average freight rate is \$2 per ton, the railroad collects \$680,000 for transportation, aside from other material and the increased crops produced by its use.

The railroads found the promotion of agriculture a bonanza and encourage it by running instruction trains over their lines, even engaging experts to promote the industry which is, however, not done out of charity or benevolence. If instead of appealing to the Interstate Commerce Commission for permission to increase freight and passenger rates to and from the farms, it would benefit the general public and save the companies the expense of operating expensive outfits on their lines to teach their employees and town folks agriculture. It is really surprising the interest manifested in agriculture by merchants, politicians, lawyers, doctors, bankers, railroad officials, promoters, organizers, demonstrators, rural up-lifters, experts, surveyors, engineers, economists, instructors, theorists, road cranks, magazine scribblers, even daily newspapers from the office on the top of sky-scrappers, fulminate full page editorials ridiculing farmers and their methods because the farm products are not equal to those of England, France, Holland, Belgium, Germany and other countries that are densely populated and whose farmers are poor. The pitiful conditions now existing in those foreign countries appear to indicate that civilization is reverting into savagery. Belgium was one vast market garden without fences, boundaries being marked by little trenches. Now it is practically ruined. The women and children perform much of the labor on the fields in foreign countries; a condition not to be envied, but coming here as sure as fate under prevailing political and economic conditions.

FARMING THE FARMERS

The woods are full of self-sacrificing patriots, and more are constantly incubating to gain a place on the State or National pay roll to avoid the drudgery of farm life and draw salaries from two to six thousand dollars a year and expenses. Some of the economists, seeing a worn out piece of machinery in a field, from a palace car window, or an auto car, get the inspiration for a topic to preach a sermon from the platform on the shiftlessness of farmers, their indolence and ignorance. Because of the limited income of \$1,500 average farm, a farm out of which to meet all expenses, the farmer has less for himself than a common laborer; yet they are chastized for having unpainted buildings, no lawns, no bathrooms, and none of the modern conveniences of the millionaire agriculturist. The

sum total of the value of agricultural products in this country of vast area seems immense in figures; but it is all consumed from year to year, and calamity howlers already anticipate starvation in the near future unless farmers can be encouraged to produce *more*. This little word of four letters has such an attractive, enticing, inviting, tempting, seductive sound that it has become the shibboleth of politicians, lawmakers and office holders by which they thrive and conquer if accompanied by the dollar mark. More appropriations, more salaries, more crops, more privileges, more power, more boodle, more graft; while the word *less* is forgotten, appearing only when labor and farming interests are involved.

The fact that farming is not remunerative commensurate with the investment and labor employed, and it is too strenuous an occupation as an investment is evident. You may sing and shout at the top of your voice, "Stay on the farm boys, stay on the farm:" they get away at the first opportunity and will continue unless conditions are modified. If those who advise other to stick to the farm would seek employment on the land and prove what they preach, it would be an encouragement to those who seek other occupations, crowding into towns and cities to find more congenial employment. Double the crops and give them away, as for instance the cotton, potato and apple crop, at less than cost, it is no incentive to produce more. Were it not for the misfortune of the eastern hemisphere, grain to day would unquestionably be selling at panic prices. Practical farmers understand that the larger the crop removed, the more fertility is lost to the soil; that if one bushel of grain removes 25c. worth, two bushels remove 50c. worth. They also know that much of an article is often worth less than a smaller quantity of the same. This fact was forcibly demonstrated when the controversy about the money standard was an issue, when 420 grs. of silver in a trade dollar was worth about $\frac{2}{3}$ as much as a standard silver coin with only 412½ grains. In this case government law regulates the value, while the value of crops is regulated by the law of supply and demand. The adoption of the gold standard was the most cruel and damnable law ever inflicted upon the people, which will prove itself by and by.

Notwithstanding the views expressed in this topic, there never was a time when the opportunities in agriculture in some directions were as favorable as the present, for a young man of good address with a diploma and a title of Prof., Doctor, or an abbreviation such as B. L., B. L. L., A. B., D. F. P., F. E. S., F. B. S. S., F. G. S., F. H. S., F. L. S., E. P. S., M. P. S., ect., to which sometimes D. F., would be appropriate. Equipped with a diploma, a few strips of litmus paper, a little hydrochloric acid, a few text-books on agriculture, some bulletins, Prof. Bailey's cyclopedia of agriculture, a good memory, a little Latin are the passports of remunerative positions under the State or National auspices.

Not long ago discussions were long and warm about Canadian reciprocity, when the farmers' market was to be extended and a reciprocal trade established for farmers to obtain cheap lumber, pickets, lath, and toothpicks. Cheap mowers and reapers, cutlery and tropical fruit, and best of all, cheap wire fencing. President Lincoln did not understand the farmer's mentality when he spoke of fooling the people: some all the time, some part of the time, and all the whole time. Since other interests are so much interested in agri-

culture, it would be only fair to reciprocate by sparing some experts to send among railroads to each economy; to the mine operators to advise them to operate full time and double their output; to the steel trust and manufacturers to teach them how to create prosperity by peddling their product over the countrylike farm produce or place it in the hands of commission houses. It would be good policy and economy if State and National administrations, would engage time keepers and restrict pay to the time of actual duty and not pay the time to high priced officials; \$10 to \$25 per day while they are away fishing, hunting, attending political meetings and electioneering. It would pay many times the cost of maintaining time clerks and facilitate public business.

It is hardly fair to mention present conditions without reference to the past. It is not so very long since farmers were regarded as low class citizens and treated as serfs and slaves. The rulers of nations and governments who claimed to rule by Divine right made vassals of their subjects and the tiller of the soil a menial of low degree. Since the settlement of this country, those who escaped from monarchial rule and persecution devised a more liberal form of government, supposed to be founded on the principle of equal opportunity for all and special privilege to none. It is only within recent years that we heard of agents of Divine providence backed by Morgan influences and tainted money as guardians and protectors of the working class of these United States. The same influence and agencies it seems now propose to take the farmers under their protective wings and dictate under what laws and regulations they may conduct their affairs or themselves. Looking back to the time of the spinning wheel, the knitting needle, the hand loom, the cradle and scythe and hand rake and the flail, to homespun and Kentucky jeans seems a far cry. The old log school house in the corner of the forest where wild beasts yet roamed is of this generation. The square room with a ten-plate wood stove in the center, and the seats ranged along the sides facing the wall, where boys and girls from seven to twenty years of age assembled studying and reciting in the one class, the studying of German lessons, of inspiration and morality from the Testament and the Book of Psalms. Handicapped for want of teachers to teach English, it was only remedied when so called Yankee teachers could be secured for a small salary and the privilege of "boarding around" from family to family under all sorts of conveniences and inconveniences. No three dollar a day hostleries to reach after midnight where menu cards, pretty servants and silverware are such an attraction to public servants on the payroll of a State. The time of rye bread, mush and milk, fat pork, N. O. molasses, cowhide boots for men and women, frequently barefoot from early spring to late fall, causing stone bruises and missing toe nails to mourn over are almost forgotten by this generation.

Those were the good old times when wheat sold at fifty cents a bushel, potatoes at no price, hay \$5 to \$8 per ton, eggs a dozen for a fi' penny bit, or ten cents a score, labor 50c. a day. The high cost of living was not a troublesome question, neither were woman suffrage, local option, prohibition and trust and trust busters agitating the people. Whisky of the good old kind (rye and apple) sold at five cents a quart and was considered a necessity, especially in the harvest field, along with big fat cherry and raspberry pies, onions, radishes,

pickles and rye bread for lunch. The crops raised on virgin soil would now be envy of the most eloquent modern institute speaker on soils, soil fertility, cowpeas, soy beans, crimson clover and alfalfa. There were no breakfast foods, canned beans, canned salmon, pressed ham, fried potatoes, canned corn, tomatoes, beans, post toasties, corn flakes, shredded wheat biscuits and other costly luxuries to create the high cost of living. The butcher, baker and grocer did not visit rural districts daily and the laundry man taking the farmers' linen would have had to travel over an entire township to secure enough shirts, skirts and collars for a half day's washing. The things now so convenient and costly create idleness and evils that are reflected in divorce proceedings and family feuds. In the past as in the present some families raised boys that were incorrigible and too lazy and cunning to work; these, if it could be afforded, were sent away to an academy and to college to become the pride of the neighborhood as doctors, lawyers, professors, legislators, bosses and aristocrats by virtue of a diploma and divine right.

Things were different before that race destroying innovation, the auto, was introduced. So long as husking-matches, snitzing parties, country dances and spelling-bees were a feature in rural affairs, there were fewer maiden ladies and bachelors abroad in the land. To-day the farmer dares to rub up against the *elite* of society even to the "400," and to discount them in good sense, intelligence, morality and the economy of nature. Farmers are preservers of the human race, although they may be tolerated as a necessity and regarded as a necessary evil, and disturbers of the criminal cunning. It is time that they appreciate their importance and unite in a common cause for their own betterment, in the interest of universal peace, and the alleviation of the distressed at home and abroad. It is time to protest against the uncalled for activities of a class of self-constituted guardians of agriculture and rural affairs, and against the centralizing in expensive departments and an army of supernumeraries not desired, never asked for or demanded. There were no petitions circulated and signed by the people to have inflicted on the tax payers, a horde of hungry aspirants to public employment tumbling over one another for the coveted prize.

It is becoming so with all the departments, divisions, agents, inspectors and law that one cannot feel safe to make a concrete walk, behead a fowl, kill a calf, or catch a fish, without a permit for fear of conflicting with some restraining authority or provision emanating from the mind of someone whose experience and mental training was derived from watching the shadows of towers and tall buildings in some city office, before a roll top desk on a revolving chair. It would make a very interesting picture if the thoughts of those who manifest so much concern about agriculture could be photographed and displayed on a reel as moving pictures and the motive back of their activities analyzed. If it were possible to open the cranium and close them without injury, to study the convolutions of their brain, the blood corpuscles coursing through their bodies, and the composition of their brain cells to learn the proportion of nitrogen, hydrogen and oxygen, it would possibly show an excess of one of the gases, an abnormal condition conducive to farmomania an indistinguished germ producing an epidemic. "Farmonania: A mental aberration, a hallucination, a phantasy, a brain storm on rural

economics." Realizing fully that the reflections in this topic will by a few be regarded as emanating from an obstructionist and fault finder, the facts are unchallengeable with which the general public will agree, especially practical farmers.

Agriculture is a gamble and superlative industry reflected in all lines of business, in stock exchanges and financial centers. While the world stands in awe at the destruction of life and property in Europe, the hand of charity is extended to the suffering, at the same time a class of unchristian and uncharitable few are beginning to speculate in business on the future and even present demands, hoping to profit from the most cruel, unholy and uncalled for war in the history of the world. It is hardly to be expected that impoverished countries and dead people will be good customers:

"May every year but bring more near
The time when strife shall cease,
When truth and love, all hearts shall move,
To live in joy and peace.
Nor sorrow reigns and earth complains,
For folly still her power maintains;
But the day shall yet appear,
When the might with the right and truth shall be;
And come what may, to stand in the way,
That day the world shall see."

REPORT OF ECONOMIC GEOLOGIST

By BAIRD HALBERSTADT

A perusal of the excellent inaugural address of Governor Brumbaugh, upon assuming the reins of government, indicates very plainly that a complete reorganization of the several departments of the State has become a necessity, and that it is his desire that such reorganizations take place without unnecessary delay, so that a better conduct of the business affairs of the Commonwealth may be instituted promptly. It is his further desire, that for every dollar appropriated by the State, its citizens shall receive a full dollar's worth. That this change will involve the State Board of Agriculture is quite probable, but to what extent and in what direction the change will be carried out can as yet only be surmised. It is patent, however, that the new Executive desires the elimination of all ornamental or useless officials in all departments, and that the money hereafter to be appropriated shall be used to the very best advantage or as he has aptly said in his reference to "Our Farms:" "The funds for the advancement of our agricultural interests ought to express themselves much more largely in wheat, corn and potatoes and less in clerical and other forms of routine service. Let us legislate

for the farmer rather than for the office holder." In this, the Governor deserves and should have the hearty support of, not only every farmer, but likewise that of every well meaning citizen of the Commonwealth.

Seven years ago, without either my knowledge or consent, the Executive Committee of this body elected me one of its Consulting Specialists, assigning to me the work of the Mineralogist and later electing me Economic Geologist. As such, it was my province to be at the beck and call of any farmer in the State for the identification of minerals and advice along geologic lines. During these seven years, many letters asking for advice, etc., have been written to me from various parts of the State. Each and every one of them has received prompt and careful attention, and was answered as fully and as explicitly as if they had been sent to me by regular paying clients. For this service, not a dollar was either asked or received, nor have I been remunerated, for postage, stationery, clerk hire or for the return charges on specimens forwarded for examination. Several cases have been brought to my attention, wherein farmers at the instance of others, have taken advantage of this gratuitous service by writing for information, and later, giving it to others, who could and should have paid for the professional services rendered. Should it so happen, that the staff of Consulting Specialists be abolished, the writer will have no regrets, but will retire with the satisfaction of having conscientiously performed each and every duty assigned to him, and that, if his advice has been followed, he has effected a saving of thousands of dollars to the farmers of Pennsylvania by advising them against prospecting for minerals in localities where there was no probability of finding them and by repeatedly warning them against men claiming to be experts, some of whom assume misleading titles without any warrant whatsoever. In fact, the State offices they claim to fill do not now nor ever did exist.

Numerous instances have been brought to our attention, wherein farmers and others have been badly advised and now mourn the loss of both time and money. Investigations of these has brought out the fact that some were due to incompetency upon the part of the adviser, others to a lack of knowledge on the part of the prospectors, while in others, there was a decided element of fraud. In one case, it was found that farmers were being solicited to buy stock in a coal mine not far from the Capitol. Of this operation, I made, at the request of some clients, a thorough examination, after which I was shown an elaborate prospectus that had been prepared by the promoters of the scheme. At the time of my visit, I met there some farmers and business men, who had gone to investigate this wonderful (?) operation. A few moment's investigation sufficed to show that carbonaceous deposit was not within the Coal Measures and that any attempts to mine the deposit would result in financial disaster. This conclusion has since been verified and the \$15,000 sunk is gone forever, unless the experience was worth it and will be profited by, for these men, like the boy who fooled around the business end of a mule, don't look quite so well, but they have a good deal more sense. We have also been called upon for opinions as to the probability of finding petroleum in paying quantities in Lehigh, Schuylkill, Carbon and Luzerne counties. Our advice was unheeded. Wells were sunk but no oil was found, nor was there the slightest

possibility of finding it in these localities, nevertheless thousands of dollars were expended in drilling and the dupes of the promoters are poorer but wiser men. From talks I have had with the farmers and others in many districts or sections of the State, I am inclined to believe that a great amount of money is wasted, annually, in Pennsylvania in the injudicious selection of fertilizers. By this I mean, that in many cases, complete fertilizers that have given good results and entire satisfaction in one section are selected for use in other sections whose soils are markedly different in structure and composition, the selection being made solely because good results were obtained elsewhere. Because a certain brand of fertilizer gives good results in the Lebanon Valley, it does not follow that results equally as good will be obtained by its use in the valley of the Schuylkill, for the reason that the soils are dissimilar in structure and composition. In other words, it might be said, that a medicine for one disease is being used, while the patient is suffering from one entirely different. The chemist is able to analyze soils and tell you the exact amount of each constituent, but as far as I have been able to learn, he is unable to tell how much of it is available or in condition to be absorbed by the plant. About the only thing left for the farmer to do is to make plant tests; a method that requires a number of years to carry out. A second plan is to make what was called basket tests, requiring but a month at the most to complete. The value of this method is questioned by some well informed men, while others equally well informed give it their unqualified approval. All, however, agree that the results as shown by this method are much surer guides than the "farmers' guess" in the selection of a fertilizer.

It must be patent to all observers that avoidable waste due to the lack of care of the barnyard manure is enormous. Dr. Van Slyke of the New York Experiment Station has estimated that the loss to the farmers of the United States from this source alone exceeds seven hundred million (\$700,000,000) dollars, annually, or the value of a crop. Perhaps some of this waste is unavoidable; the greater part of it, however, is *avoidable*. The value of the wasted material is seemingly fabulous, but when the case is investigated, it will be found that the estimate of Dr. Van Slyke is not only reasonable but is based upon facts and figures, that can be relied upon. These figures are almost fabulous and the losses appalling.

Let us examine into the matter and we will see that the results are not overdrawn and that it is "a condition and not a theory confronting us." The United States Department of Agriculture has estimated the annual value of manure of livestock, if preserved, per animal, as follows:

Horse manure,	\$27 00
Cattle manure,	19 00
Hog manure,	12 00
Sheep manure,	2 00

The losses due to exposure through leaching, washing away and evaporation are tremendous, as has been demonstrated by Roberts in his experimentation extending over many years, and Dr. Taylor has published tables showing the percentages of loss in both gross weight

and in plant food, as well as the financial loss. The first table gives the losses in horse manure placed in a pile and the second is of cow manure. They are as follows:

TABLE NO. 1

	April 25th. Pounds.	September 25th. Pounds.	Loss. Per cent..
Gross weight,	4,000	1,730	57
Nitrogen,	19.60	7.79	60
Phosphoric acid,	14.80	7.79	47
Potash,	36.00	8.65	76
Value per ton,	\$2 80	\$1 06	62

TABLE NO. 2

	April 25th. Pounds.	September 25th. Pounds.	Loss. Per cent..
Gross weight,	10,000	5,125	49
Nitrogen,	47	23	41
Phosphoric acid,	32	26	19
Potash,	48	44	8
Value per ton,	\$2 29	\$1 60	30

While on a trip last summer, I visited a farm where the farm house was modern; it is well heated, the owner has his own gas plant, hot and cold water, and, in fact, all modern conveniences. The barn and outbuildings were in splendid condition, in fact, one would have judged the owner to have been an up-to-date, prosperous farmer. A further examination developed the fact that he had an old fashioned barnyard in which the manure was thrown, when removed from the barn, seeping between the stone wall between it and the highway, and ultimately finding its way into and polluting the creek was found a stream of rich brown liquid, the drainage of his barnyard. Based upon the following prices: Nitrogen at 18 cents, phosphoric acid 5 cents and potash at 5 cents, that liquid or drainage from this manure heap was worth \$10.40 per ton. That man was not only losing money, but was, unthinkingly, perhaps, seriously polluting a stream of good water. Each ton of drainage from a manure heap, it has been estimated, contains thirty (30) pounds of nitrogen, two (2) pounds of phosphoric acid and ninety-eight (98) pounds of potash.

In striking contrast were the conditions found on the farm of my friend and colleague, Mr. William H. Stout, on his "Fairview Farm." His manure pit is a wagon with a tight box, a concrete gutter at the rear of the stalls conveys the liquid excrement to a tank. Every day or two, the manure, after the liquid has been poured over it, is hauled out to and deposited where needed on the fields, and this is done the

year around. The solid and liquid manure from the hog pens is drawn into a concrete tank and mixed with an absorbent. All the droppings from the poultry houses are carefully preserved. Mr. Stout was, I believe, one of the first, if not the first man, in his section to spread the manure on his fields at once, instead of throwing it out into a pit or barnyard, where it would again have to be handled a second time in loading. It was due to these saving methods, that Mr. Stout was able to transform a wornout farm into a productive one; to increase the yields of his fields from one-half ton to three (3) tons of hay per acre, and his yield of wheat from nothing to twenty (20) to twenty-five (25) bushels, his oats to twenty-three (23) bushels, corn, seventy (70) bushels and potatoes to two hundred and twenty-five (225) bushels per acre, and these on fields that, in his first year, the crops were practically a failure. Another thing he did was to lay five (5) miles of stone and tile drains in marshy fields; the result is that he is cutting three (3) tons of hay per acre, where before nothing would grow but swamp plants and grasses. Here is a farmer who works with his head as well as his hands, a practical scientific farmer, as it were. Without the reading and studying of scientific works, government bulletins and farm journals, he could not have accomplished these results, but would have given up in despair.

The government, Federal and State, are doing more for the farmers than for any other class of citizens. By an expenditure of a few cents for postal cards, the Department of Agriculture will, without further expense, send to any farmer in the country a practically complete library on agriculture and cognate subjects for the asking. The time has gone by, when the farmer is looked down upon, if he ever really was, for the public, as it becomes more highly educated, will appreciate how great a factor the farmer is in our lives. Without farmers, famine would be upon us. The farmer of to-morrow must know much about science if he would succeed. Our fields have been robbed of much of their fertility and this must be restored if this nation is to survive. Many farms, now worn out and abandoned, must be restored, or we will be unable to feed the rapidly increasing population of non-producers. The enormous exports of grain and of livestock to foreign lands will cost this country dear in the end, for, as that great Agriculturist Chemist, Justus von Liebig, has observed: "The manure produced in the course of farming is not sufficient to maintain, permanently, the fertility of a farm; it lacks the constituents which are annually sold in the shape of grain, hay, milk and live stock." A few days ago, a dispatch appeared in the "public press," setting forth that 40,000 horses had been sold in the West for exportation abroad. That single shipment of horses will cause a loss of over \$1,000,000 to us in the value of the manure they would have produced during the present year, had they remained in this country.

I have observed here, that I have served as one of your Consulting Specialists without financial remuneration, and willingly, for the delightful associations with you all and the warm and lasting friendships I have contracted among you, pay me infinitely more than any financial reward, and should the staff of Specialists be abolished, my only regret will be in the breaking off of our pleasant official relations.

REPORT OF COMMITTEE ON LIVESTOCK

By WILLIAM C. BLACK, *Chairman*.

"A condition and not a theory" confronts us. The people of Pennsylvania are in a dilemma. They can choose either horn; to soon become vegetarians or to breed and feed on their farms more meat producing animals. The population of the United States has increased 20 per cent. in the last decade and the number of meat-producing animals has decreased in about the same ratio. The spread between meat production and meat consumption under existing conditions, must become wider and wider as the years go by. Not only the United States but the whole world is facing a famine in meats, shoes and warm clothing. One county in Pennsylvania has increased 151 per cent. in population in the last 20 years. In my own county, on what was a farm, in three years, was built a town of 9,000 people. It is predicted that when this European war is over there will be a great influx of immigrants to the United States. The large increase in population is almost entirely of the consuming class. Under such conditions it is not surprising that only plutocrats and high salaried people, such as County Chairmen of Farmer's Institutes can afford meat for dinner.

When the "powers that be," ordained that we should have Free Trade in the United States, the stockmen were paralyzed. They saw vast numbers of livestock crossing our northern border from Canada. They saw vast fleets of merchant vessels, loaded to the gunwale, with meat from Argentina and Australia; they saw our meat market demoralized and our livestock men ruined. What has been the result? The year 1914 has shown the highest average price for livestock ever recorded in the United States. The shortage in Canada is greater than in this country. During 1914 at one time, cattle sold higher in Toronto than in the United States. During the first three months of free trade, there came across the wide waters enough meat to make one dinner for each person in the United States.

The causes of the high prices of meat are many. I mention but few of them. The sub-division of ranges into farms, and ranches for so-called dry farming. The overstocking of the ranges until they carry but a small per cent. of the livestock formerly carried. The large increase in the dairy industry, which is a negligible factor in the meat supply; the high cost of incompetent labor; the slaughter of the innocents, roaster pigs, veal calves, baby beeves; the greatly increased value of land in the corn belt, and the consequent high cost of feed. The telephone also adds to the high cost of meat. The resident of the town sits in a cozy room and orders by telephone a pound of steak or a small roast which is delivered by a high salaried driver in a high price motor truck, and the account is charged on the butcher's book by a high salaried clerk. When the bill is rendered, it is not surprising that the head of the house curses the

beef trust, the railroad corporation, the butcher and all down the line even to the livestock breeder, who is quite sure is getting rich too quick.

The condition is alarming; what is the remedy? Animal husbandry and agriculture are indissolubly linked with national prosperity. We must replenish our herds from within our own borders. No other source is available. In the beginning we must retain for breeding purposes all suitable females, and use sires of good blood and feed generously. Breed and feed are as inseparable as were the Siamese twins. Our herds and flocks can only be replenished by Nature's slow process, and an expert sent by the United States Department reports that not before 10 years can beef production become normal. Save the innocents and care for them until they reach a reasonable degree of maturity, not selling pigs as roasters but as more mature animals. A neighbor had a sow that produced ten pigs; another had one which produced twenty-four at one birth, but that is another story. The ten pigs were sold as roasters at eight to ten weeks old for \$30 or an average of \$3.00 each. Had these pigs been kept approximately one year old, either one of them should have produced as much meat as the ten roasters and would have sold for as much money, and would have paid a good profit on the feed consumed. Lambs are sold, when weighing from forty to eighty pounds. They should be kept one year longer and the best ewe lambs retained as breeders. And the culls and wethers sold furnishing a much greater quantity of meat, and having paid a good profit on feed consumed. Calves of the beef breeds and their grades should be kept until maturity, when they will furnish many times as much meat as will veals, and will pay a good profit on feed consumed. I have not counted the labor for caring for the stock, as any farmer who wishes to retain fertility on his farm will furnish the labor for the manure for the feed consumed.

It is essential to success that only pure bred males be used and these should be of individual excellence coupled with a good pedigree. The choice of a breed is a matter of individual preference and environment. In many cases environment is the controlling factor. There is no best breed. There is no battle of the breeds. There is no conflict between breeders of the Jersey and Guernsey and Holstein, of Angus and Hereford and Short-horn cattle. There is no conflict between breeders of long wool, medium wool or merino sheep. No conflict between breeders of black hogs and white hogs. Let us then as breeders of livestock, not in conflict with one another, but in solid phalanx, shoulder to shoulder, make one grand effort in a war of extermination against the scrubs.

The future looks bright to the livestock breeders in Pennsylvania. Success depends on his efforts. A vast population must be fed. Pennsylvania has, within her borders, resources sufficient to meet the demand. May the farmers and livestock breeders of the Keystone State seize this opportunity and secure for themselves millions in money and largely increased fertility for their farms.

REPORT OF COMMITTEE ON POULTRY

By W. THEO. WITTMAN

Gentlemen: It would appear that some quite radical changes have occurred in the poultry situation in the State within the last twelve months. The most outstanding of these is the slump in the fancy poultry business. Of the some hundred and ten poultry associations in the State, something like one-third dropped their annual poultry show this year. And while it is difficult to arrive at exact figures, it is very likely that at least an equal per cent. or about one-third of the entire number of poultry people terming themselves "fanciers" have quit as such. Also those associations that did hold their annual shows found, with very few exceptions, it is even more difficult than usual to come out on the right side of the balance sheet. This condition of affairs is due to several causes, the details of which would consume more time than is allowed this report. Summed up, and in its final analysis:

THE GENERAL PUBLIC IS MORE AND MORE INTERESTED IN POULTRY ONLY SO FAR AS IT WILL LAY EGGS AND GROW POUNDS OF MEAT AND ONLY A COMPARATIVELY SMALL NUMBER WISH TO KEEP AND BREED POULTRY AS A "FANCY."

The more progressive of the poultry associations have introduced monthly lectures and demonstrations and others have had them every afternoon and evening during show week and have found that they are well attended and a great deal of interest shown. As an example: At Pittsburgh Show last week with lectures every afternoon and evening the hall was crowded every session. The next big change in the poultry situation is as a result of the European war. This war has removed all fear that, with the tariff taken off eggs, our markets would be flooded with foreign eggs; for even after a few months of war the big European poultry growing nations, Belgium, France, England, Germany, etc., have practically wiped out their enormous poultry stocks and with the end of the war, Europe for a while at least, must be an importer of poultry and eggs instead of as formerly, as exporter.

Another change in our poultry situation is the rapidly growing acceptance of the fact that poultry, just like other farm animals, can be bred for production. In consequence, a big demand has sprung up for stock that has avowedly been bred to lay eggs. Pennsylvania breeders of this kind of poultry have found trade very brisk, and in some instances, at least, egg farmers carrying thousands of hens have already sold in advance every egg for hatching, their flocks can possibly lay this season.

Again, the poultry people of the State feel that at last perhaps they are in a situation, where they can introduce a bill before the Legislature creating a Bureau of Poultry Husbandry as part of the

Department of Agriculture and carrying other features, with some hope of success. For the people of the State are hungry for reliable poultry information and reliable poultry service and having had a taste of it as provided by the Bureau of Farm Advisers and by the poultry associations, they want to have and will have more of it, and deserve to have it. Prices for poultry and eggs this last year have been good average for the year: Eggs, 31c per dozen; live poultry, 13c a lb.; dressed poultry, 18c per lb.

ADDRESS—DR. SPARKS

It is awfully good of you, Mr. Hutchison, and men and women of the Board. This meeting comes at an unfortunate time for me in some particulars, because it is held simultaneously with the meeting of the State College Trustees and they have long sessions, especially this year when we are looking forward toward the legislative appropriations. The Governor presided yesterday afternoon and you people will be interested, I think, knowing that in his opening address the burden of his remarks was how the College can be of more service to the farm producer in garnering his crop and in getting it to the market, and I think we are all to be congratulated on having a man who, himself, though in recent years a city man, nevertheless has not forgotten his early life in the country and who is making such an effort to study the rural problem and the problem of the rural resident in order to improve matters generally.

I think we all feel a little bit sad in this meeting to think that the Secretary who has presided—not presided, but acted as Secretary for so many years, is approaching what seems, from his side at least, to be the last meeting that he will be with us in his official capacity. It has been my great pleasure to have him on the Board of Trustees of the Pennsylvania State College in the six years I have been connected with the School, and I should be false to every dictate of fairness and judgment if I did not say that, notwithstanding the busy official life that he leads in the Department, he nevertheless, has found time to attend nearly every meeting of the Board of Trustees of the College, and those of you who have been to State College know that it is not an easy matter to reach there. We have a Penitentiary six miles away which I believe is more accessible than the State College. The journey up there and back consumes some little time, and yet the Secretary has always found time to be there and give us the benefit of his judgment in matters pertaining to the School of Agriculture and to the Agriculture Experiment Station, and, in fact, to the entire college, because he is such a broad minded man that he realizes the fact that the student of agriculture ought to come in contact with the student of other lines of work so as to give him a broad view and make him a man of the world; because on the farm he has had to come in contact

with the commission merchant and with the shipping agent and all the various lines of work, not alone the cultivation of the soil, but other lines as well, including the fertilizer man.

Now I have no speech to make except simply to pay this little tribute to Secretary Critchfield and also to speak of the interest that Governor Brumbaugh is taking in our agricultural work, and to say that the State College and Experiment Station, so far as its agricultural interests are concerned, continue to stand in the hope of being useful in all possible manner to the agricultural interests of the State.

The Smith-Lever Bill, as just passed, has vast possibilities. It makes one tremble almost at times to think of what that administration will amount to in a few years, and if we can get that in the right channel, it will be the most beneficial to the taxpayers of Pennsylvania, and that is the last desideratum, that is the thing we all want to do, and with that and the present conditions altogether, it seems to me that the future of the agricultural interests in his State seems to be especially bright and promising and hopeful, if only we can find a way to the market, if only the ambitions of certain foreign rules—if only this intangible thing they call the balance of power, for which they are killing men and piling up an enormous national debt—and what does it amount to in the end? You and I believe that it is not worth the death of one soldier, the most ignorant, cheapest, meanest soldier that dies; it is not worth that, and we shall be fortunate of course if we can keep our neutrality and keep out of it, but we shall find our market hampered to a certain extent, and I, for one, cannot believe that it is a wise thing to try to starve out the enemy by bolting our own front door. We tried that one time, in President Jefferson's administration, in order to keep neutrality or try to avoid getting entangled in the Napoleonic Wars, to avoid feeding the enemy of one nation and offending another nation. We put an embargo on our vessels. Within one season the crops were piled up in the warehouses; business had become stagnant, and while trying to starve out the enemy, we were starving ourselves.

REPORT ON FEEDING STUFFS

By G. G. HUTCHISON

As your Specialist on feeding stuffs, I beg permission to make a report to this body concerning the condition of the feeds sold in Pennsylvania and the work done by the Department of Agriculture during the year just closed. It is well known to you all that there has been a marked advance in the price of the many feed products throughout the country since early last fall. This condition has

caused an advance in the value of selling price of the various grades of commercial feeding stuffs offered for sale in our State. Because of this situation, therefore, there has been a temptation on the part of some feed manufacturers to discover and use some cheap by-products for use as ingredients in feeds, which perhaps has little feeding value, in order to take advantage of the rise in market value in feeds and also, if possible, to offer for sale feeds at less prices. We are glad to report, however, that the majority of manufacturers are complying with the requirements of the law and co-operating with the Department in its effort to keep the character of feeds sold in the State of good quality and properly labeled.

In order that you may know of the amount of work accomplished by the Department in enforcing the feeding stuffs law, it seems proper to include this information in this report. During the year 1914, special agents of the Department visited 327 towns and cities and 61 counties of the State and obtained 1,300 samples of the various brands of feeding stuffs found being offered for sale. All these samples were sent to the Chemical Laboratory and analyzed chemically to see if the guarantees were properly given; and they were also examined with a microscope to find out if the ingredients claimed were really present in each case. Foreign or impure materials were also looked for and where such were found, in addition to the ingredients claimed, a report was made to the Secretary of these findings, together with the results of examination of all samples, and also included in the annual feed bulletin. A number of towns and cities were visited where samples were not taken, as it was found by the special agents that the feeds being offered for sale appeared to be properly labeled and guaranteed, and also because it was thought unnecessary to get too many samples of the same brand or class of feeds.

The character of the feeds, judged from the samples analyzed in the Laboratory, was good and the number of feeds found adulterated was less than formerly, which goes to show that the rigid enforcement of the feeding stuffs law has been of great value to the farmers and consumers of feeds in our State. The number of prosecutions necessary for misbranding or adulterated feeds gets less and less, each year. However it is still necessary to keep a watchful eye on all the various brands of feeds which are being sold, otherwise there is likely to be a number of brands of adulterated feeds sent into our State. This work is especially necessary because there are 20 states, some of which have no feed laws at all, and some of which, while they do have laws, the ingredients of mixed feeds are not required to be placed on sacks or attached cards. As long as this condition exists there will be feeds sold in these states of inferior quality and we must be continually on the watch to make sure that they do not get into Pennsylvania. One such case occurred during the year where a molasses feed was shipped from a western state to one of our feed dealers which contained 25% of ground peanut hulls. The Chief Chemist of the Department, who has been appointed by the Federal Government as a Special Agent of Pennsylvania, was in a position to report this case to the Federal authorities who immediately got samples of this feed and took action against the manufacturers in the West and thus this form of misrepresentation was stopped so far as our State was concerned. We now have

reason to believe that no such adulterated feeds are being sold in the State. As a matter of record, I will include with this report the list of towns and counties visited by our special agents and the number of samples taken in each, which I will not read, but which will be included in the proceedings:

**COUNTIES VISITED AND NUMBER OF SAMPLES OF FEED-
ING STUFFS SECURED.**

County.	Places.	No. of Samples.
Adams,	1—Littlestown,	7
	2—New Oxford,	11
	3—East Berlin,	1
	4—Gettysburg,	12
	5—Bendersville,	0
	6—Biglerville,	0
	7—McSherrystown,	0
Total,		31
Allegheny,	1—Pitcairn,	1
	2—Pittsburgh,	22
	3—Carnegie,	5
	4—Wilkinsburg,	8
	5—Braddock,	8
	6—Aspinwall,	0
	7—Brackenridge,	0
	8—Bridgeville,	0
	9—Hays,	0
	10—Elizabeth,	0
	11—Homestead,	0
	12—McKeesport,	0
	13—North Braddock,	0
	14—Tarentum,	0
	15—Wilmerding,	0
	16—West Elizabeth,	0
Total,		44
Armstrong,	1—Kittanning,	8
	2—Apollo,	2
	3—Leechburg,	6
	4—Ford City,	1
	5—Freeport,	0
Total,		17
Beaver,	1—Rochester,	6
	2—Beaver Falls,	7
	3—New Brighton,	4
	4—West Bridgewater,	2
	5—Ambridge,	0
	6—Beaver,	0
	7—Freedom,	0
	8—Monaca,	0
Total,		19
Bedford,	1—Bedford,	9
	2—Everett,	1
	3—Saxton,	0
Total,		10

County.	Places.	No. of Samples.
Berks,	1—Reading,	26
	2—Kutztown,	7
	3—Fleetwood,	2
	4—Womelsdorf,	11
	5—Birdsboro,	0
	6—Mount Penn,	0
	7—Topton,	0
	Total,	46
Blair,	1—Altoona,	34
	2—Bellwood,	0
	3—Gaysport,	0
	4—Hollidaysburg,	0
	5—Juniata,	0
	6—Tyrone,	0
	Total,	34
Bradford,	1—Canton,	6
	2—Troy,	3
	3—Towanda,	14
	4—Athens,	0
	5—Sayre,	0
	6—Wyalusing,	0
	Total,	23
Bucks,	1—Quakertown,	11
	2—Doylestown,	12
	3—Chalfont,	0
	4—Newtown,	0
	5—Perkasie,	0
	6—Richlandtown,	0
	Total,	23
Butler,	1—Butler,	20
	2—Harmony,	0
	3—Mars,	0
	4—Evans City,	0
	Total,	20
Cambria,	1—Johnstown,	18
	2—South Fork,	8
	3—Ebensburg,	0
	4—Patton,	0
	5—Carrolltown,	0
	Total,	26
Cameron,	1—Emporium,	8
	2—Driftwood,	0
	Total,	8
Carbon,	1—East Mauch Chunk, }	4
	2—Mauch Chunk, }	
	3—Lansford,	0
	4—Lehighton,	0
	Total,	4

County.	Places.	No. of Samples.
Center,	1—Philipsburg,	7
	2—Howard,	4
	3—Bellefonte,	8
	4—Unionville,	0
	Total,	19
Chester,	1—Coatesville,	9
	2—Parkesburg,	5
	3—West Chester,	11
	4—Westgrove,	8
	5—Downingtown,	5
	6—Paoli,	10
	7—Atglen,	0
	8—Avondale,	0
	9—Kennett Square,	0
	10—Malvern,	0
	11—Phoenixville,	0
	12—Pocopson,	0
	Total,	48
Clarion,	1—Clarion,	7
	2—New Bethlehem,	0
	3—East Brady,	0
	Total,	7
Clearfield,	1—Munson,	2
	2—Wallaceton,	5
	3—DuBois,	8
	4—Coalport,	0
	5—Houtzdale,	0
	6—Osceola,	0
	Total,	15
Clinton,	1—Lock Haven,	13
	2—Millhall,	0
	3—Renovo,	0
	Total,	13
Crawford,	1—Titusville,	10
	2—Linesville,	11
	3—Conneaut Lake,	0
	4—Hydetown,	0
	5—Springboro,	0
	Total,	21
Cumberland,	1—Mechanicsburg,	7
	2—Carlisle,	8
	3—Newville,	4
	4—Shippensburg,	8
	5—Lemoyne,	0
	6—Mount Holly Springs,	0
	Total,	27

County.	Places.	No. of Samples.
Dauphin,	1—Harrisburg,	15
	2—Millersburg,	2
	3—Hummelstown,	4
	4—Highspire,	1
	5—Middletown,	0
	6—Penbrook,	0
	7—Steelton,	0
	Total,	22
Delaware,	1—Media,	12
	2—Morton,	0
	3—Swarthmore,	0
	Total,	12
Elk,	1—Ridgway,	8
	2—St. Marys,	8
	3—Johnsonburg,	0
	Total,	16
Erie,	1—Erie,	17
	2—Wesleyville,	7
	3—Belle Valley,	0
	4—Corry,	0
	5—Girard,	0
	6—Union City,	0
	Total,	24
Fayette,	1—Uniontown,	10
	2—Belleverson,	0
	3—Brownsville,	0
	4—Connellsville,	0
	5—Dunbar,	0
	6—Fairchance,	0
	Total,	10
Franklin,	1—Chambersburg,	15
	2—Greencastle,	0
	3—Mercersburg,	0
	Total,	15
Greene,	1—Waynesburg,	3
Total,	3	
Huntingdon,	1—Mapleton,	6
	2—Huntingdon,	2
	3—Mount Union,	0
	4—Petersburg,	0
	Total,	8
Indiana,	1—Indiana,	9
	2—Blairsville,	11
	3—Homer City,	4
	4—Blacklick,	0
	5—Clymer,	0
	6—Creekside,	0
	7—Saltsburg,	0
	Total,	24

County.	Places.	No. of Samples.
Jefferson,	1—Reynoldsville,	5
	2—Brookville,	4
	3—Landsey,	5
	4—Punxsutawney,	8
	5—Big Run,	0
	6—Brockwayville,	0
	7—Falls Creek,	0
	8—Summerville,	0
	9—Sykesville,	0
Total,		22
Juniata,	1—Mifflin,	6
	2—Port Royal,	2
Total,		8
Lackawanna,	1—Scranton,	18
	2—Carbondale,	0
	3—Dunmore,	0
Total,		18
Lancaster,	1—Lancaster,	21
	2—Elizabethtown,	12
	3—Quarryville,	6
	4—Gap,	6
	5—Christiana,	4
	6—Lititz,	6
	7—Manheim,	12
	8—Columbia,	0
	9—Ephrata,	0
	10—Mount Joy,	0
	11—New Holland,	0
	12—Strasburg,	0
Total,		67
Lawrence,	1—New Wilmington, }	5
	2—Neshannock Falls, }	
	3—New Castle,	19
	4—Ellwood City,	0
	5—South New Castle,	0
	6—Mahoningtown,	0
	7—Wampum,	0
Total,		24
Lebanon,	1—Palmyra,	16
	2—Lebanon,	2
	3—Cleona,	2
	4—Myerstown,	9
	5—Avon,	5
	6—Annville,	0
	7—Jonestown,	0
Total,		34
Lehigh,	1—Allentown,	19
	2—Bethlehem,	0
	3—Catasauqua,	0
	4—Emaus,	0
	5—South Allentown,	0
Total,		19

County.	Places.	No. of Samples.
Luzerne,	1—Wilkes-Barre,	30
	2—Luzerne,	9
	3—Nanticoke,	8
	4—Forty Fort,	0
	5—Kingston,	0
	6—Nescopeck,	0
	7—Pittston,	0
	8—Plymouth,	0
	9—Shickshinny,	0
	Total,	47
Lycoming,	1—Williamsport,	13
	2—Muncy,	7
	3—Antes Fort, }	
	4—Jersey Shore, }	
	5—Montgomery,	0
	6—South Williamsport,	0
	Total,	26
McKean,	1—Bradford,	18
	2—Smethport,	4
	3—Port Allegany,	4
	4—Kane,	14
	5—Eldred,	0
	6—Mount Jewett,	0
	Total,	40
Mercer,	1—Sharon,	9
	2—Farrell,	4
	3—Greenville,	0
	5—Jamestown,	0
	6—Mercer,	0
	7—Sharpsville,	0
	Total,	13
Mifflin,	1—Lewistown,	14
	2—McVeytown,	0
	3—Newton Hamilton,	0
	Total,	14
Monroe,	1—East Stroudsburg, }	8
	2—Stroudsburg, }	
	Total,	8
Montgomery,	1—Pottstown,	10
	2—Lansdale,	11
	3—Conshohocken,	66
	4—Norristown,	7
	5—Edge Hill,	6
	6—Ambler,	6
	7—Jenkintown,	0
	8—Hatfield,	0
	9—North Wales,	0
	10—Royersford,	0
	11—West Conshohocken,	0
	12—Glenside,	0
	Total,	46

County.	Places.	No. of Samples.
Northampton,	1—South Bethlehem,	6
	2—Easton,	12
	3—Bethlehem,	0
	4—Slatington,	0
	Total,	18
Northumberland,	1—Sunbury,	15
	2—Shamokin,	11
	3—Milton,	8
	4—Mount Carmel,	0
	5—Northumberland,	0
	6—Watsonstown,	0
	Total,	34
Perry,	1—Millerstown,	2
	2—Marysville,	0
	3—Newport,	0
	Total,	2
Philadelphia,	1—Philadelphia,	2
	Total,	2
Potter,	1—Coudersport,	11
	2—Ulysses,	0
	Total,	11
Snyder,	1—Salinsgrove,	2
	2—Middleburg,	0
	Total,	2
Somerset,	1—Windber,	10
	2—Middleburg,	0
	Total,	10
Susquehanna,	1—Montrose,	11
	2—Hallstead,	0
	3—New Milford,	0
	4—Alford,	0
	Total,	11
Tioga,	1—Westfield,	10
	2—Wellsboro,	19
	3—Blossburg,	0
	4—Elkland,	0
	5—Knoxville,	0
	6—Lawrenceville,	0
	7—Osceola,	0
	8—Tioga,	0
	Total,	29
Union,	1—Lewisburg,	6
	2—West Milton,	6
	3—Mifflinburg,	4
	Total,	16

County.	Places.	No. of Samples.
Venango,	1—Oil City,	14
	2—Franklin,	5
	3—Emlenton,	0
	4—Rouseville,	0
	5—Siverly,	0
	Total,	19
Warren,	1—Warren,	8
	2—Youngsville,	3
	3—Columbus,	0
	4—Sheffield,	0
	Total,	11
Washington,	1—Washington,	13
	2—Huston,	8
	3—Charleroi,	8
	4—Monongahela,	9
	5—Donora,	3
	6—Canonsburg,	12
	7—South Canonsburg,	0
	8—Speers,	0
	9—West Brownsville,	0
	Total,	53
Wayne,	1—Honesdale,	11
	2—Hawley,	0
	Total,	11
Westmoreland,	1—Latrobe,	2
	2—Greensburg,	14
	3—Mount Pleasant,	3
	4—Irwin,	2
	5—New Stanton,	2
	6—Scottdale,	11
	7—New Kensington,	6
	8—Parnassus,	3
	9—Monessen,	4
	10—Jeannette,	4
	11—Bolivar,	0
	12—Derry,	0
	13—North Bellevernon,	0
	14—South Greensburg,	0
	15—Trafford,	0
	16—Manor,	0
	17—Vandergrift,	0
	Total,	51
Wyoming,	1—Meshoppen,	9
	2—Mehoopany,	0
	3—Tunkhannock,	0
	Total,	9
York,	1—York,	24
	2—Hanover,	15
	3—Dillsburg,	0
	4—Glen Rock,	0
	Total,	39
Grand total,		1303

It will be of interest to you gentlemen to learn some of the problems with which the Department has been confronted during the past year. In former reports I took up the subject of the analysis and composition of the various feeds being sold on our markets. This information has been from time to time, also published in our annual bulletin, therefore, I will not take up your time by again going over this subject in detail. This information can be obtained by getting the last Feeding Stuffs Bulletin No. 249. In watching out for foreign materials which might be used as ingredients in mixed feeds, the chemists identified a by-product, which was in the form of a light colored finely ground substance, as being vegetable ivory. It was discovered that this product was the ground residues or borings and cuttings from the manufacture of buttons from the ivory nut. This nut resembles true ivory in its color and texture hence its name, and it grows on a specie of palm tree in South America. This ground up button borings, from what we could learn, is likely to be put into mixed feeds and sold in states where they do not have a rigid enforcement of the feeding stuffs law. It has no feeding value whatever, and as a result of our finding out the character of this material, we are now prepared to identify it if it is ever used as an ingredient in feeds sold in our State.

Another product that certain dealers tried to sell in our State as an ingredient in mixed feeds is a substance known as "Peat" and which in some cases is called "Humus." This material is dug out of the bogs and lowlands of the West. Feeding value is claimed for it when used or mixed with molasses in these kind of feeds. As a result of the investigation and study of this material, the Department has refused to register feeds containing it or to permit its sale in the State for the reason that as it contained approximately 13% of insoluble matter. It was not believed to have any feeding value.

Another problem to which considerable attention has been given is in keeping whole weed seeds out of chicken feeds, as required by the law. The character of chicken feeds sold in the State is getting better and better each year; however, there has been a few brands found which contains them. And in several cases it was found necessary to take action against the parties handling them. As a result of this work, and after a conference with the officials of one company, it was finally agreed by this company to keep whole weed seeds out of their chicken feeds which were being sold in the State without causing a lengthy court trial to be held to settle the contention of the Department. The promise of this concern, as well as of others who sell chicken feeds to comply with the requirements of the law, will tend to make this class of feeds better than ever before. It will also not be necessary for the department to analyze so many samples of this brand and be continually on the watch for this form of violation. One class of feeds with which we had considerable trouble early in the enforcement of the law, was the so-called molasses feeds. A few years ago these feeds contained large amounts of whole weed seeds and other adulterants, but at the present time this class of feeds sold in our State are practically free from whole weed seeds. The various kinds of grain screenings that are usually used in the manufacture of molasses dairy feeds, and which contain varying amounts of cereal grains and weed seeds, are now being finely ground, pulverized and in some cases bolted before they are used.

The usual name given in labeling this class of feeds, which contain this product, is ground screenings meal. The process of grinding the screenings to a fine meal, destroys the germ and thus prevents germination. Screenings meal will analyze from 15% to 17% of protein, and therefore contains considerable feeding value.

For the information of purchasers of this class of feeds, the law requires that the ingredients be named on the sacks or attached cards, so that when these feeds are offered for sale, their composition as well as the analysis can be found out by reading the information printed on the sacks or cards. We have had a little trouble with the method of guaranteeing cottonseed meal. In some cases this feed was found to contain excessive amount of cottonseed hulls, but the number of meals containing hulls which are sold are becoming less. Purchasers of cottonseed meal should pay attention to the guarantees given which are often misleading because of the so called sliding guarantee, as for example,—38.62% to 43.00% or more percentage of protein. Where such guarantees are given, the higher figures are not often met and, therefore, it is recommended that in buying this product you should base the sale on the lower guarantee, as this figure will usually be met without any trouble. The Association of Feed Control Officials, as well as our department, is investigating the method of guaranteeing cottonseed meals. The Chief Chemist inspected a number of cottonseed meal plants in the South in an attempt to get some information on this subject, and it was found that in the majority of cases the protein content could be controlled and the guarantee given maintained. The result of this inspection will, undoubtedly, help to make uniform the guaranteeing of cottonseed meal and it is hoped the manufacturers can be persuaded to give only one guarantee for this product and thus prevent confusion and misrepresentation where the sliding guarantees are given, as is the case in many brands now being sold.

Registrations for practically every brand of feed sold during 1914 was received by the Department. The total number of registrations received was, approximately, 625, representing 2,300 different brands. In a number of cases in these registrations, when received, where the method of giving the ingredients, or where it was thought that the feeds were not free from weed seeds or other materials, samples were asked for from the companies and carefully examined. In a number of cases registration was refused for certain brands which contained by-products prohibited by our law. In other cases they were sent back for correction, with directions for stating the true guarantees and compositions. We have had a number of requests for the digestible or true feeding value of a number of mixed feeds, and in some cases, this information can be given. In the majority of cases, however, digestion experiments have not been made on many of the by-products used in mixed feeds and, therefore, in such cases where this information is not known, and where the amount of each ingredient used in a mixed feed, and the analysis of same, is not known, this information cannot be accurately given. A number of digestion experiments are being made, however, on many of the by-products used for mixing feeds by our Experiment Station and in other states. It is hoped that in the near future the results of this investigation will be in such shape that the true feeding value of most of the feeds can be estimated more accurately than can now be done.

You, no doubt, are aware that we can analyze samples of feeds for any of you gentlemen where it is suspected the guarantees are not met. We are ready and willing to at all times give you all the information on the subject of feeds which we possibly can. If any feeds which you gentlemen buy does not look good, send a sample to the Department for examination. We want your hearty cooperation in this work, so therefore, do not hesitate, at any time to call on us for information.

Before closing, I desire to call your attention to another problem with which the Department is confronted. Samples are sent to the Department Laboratory, from time to time, which are suspected of causing illness to stock; and in these cases it is seldom found that the trouble was due to the feed. If any of you gentlemen have any cause to suspect illness or death from feeding any brand of feed, you should get a veterinarian to make an examination of the stock, as in many cases, it has been found that the trouble is caused by some form of illness rather than to the feed being used.

ADDRESS OF DR. THORNE

It is always a pleasure to me to meet the Pennsylvania farmers, and especially to meet this Pennsylvania State Board of Agriculture, who have shown their interest in the practical work of the farm in so many ways. Your conditions over a large part of your State are quite different from those in Ohio, and yet you have in northwestern Pennsylvania, conditions very similar to those we have in northeastern Ohio. The results that we have attained, therefore, in our northeastern Ohio location, on the soil selected there are of considerable value to the farmers of northwestern Pennsylvania. Our conditions do not so nearly represent those of eastern Pennsylvania where you have more limestone in your soil than we have in eastern Ohio, but our station has been allowed to adopt the policy of extending its work over all the typical soils of the State or over the principal typical soils of the State, through the means of test farms or county experiment farms located in different parts of the State. We have been able, therefore, through this medium, to reach some of the larger types of soils in our State as well as the one on which the Experiment Station itself is located, and it is by this means that we have been able to check up and tally the work done at the central station in such a way as to many times modify our judgment and cause us to go slow in announcing results. And on the other hand, to feel the more sure in some cases that the results attained are of general application.

It seems very much like carrying coals to Newcastle to come into Pennsylvania and talk about liming the land, for our traditions respecting the use of lime on the land came into Ohio, carried by the Pennsylvania farmer when he came across and settled in our State; but 25 years ago the use of lime on the land was practically unknown

in Ohio. A few farmers had, in a desultory way, made some experiments, but Ohio settlement began a long time after that of Pennsylvania and the Pennsylvania German, when he came into eastern Ohio, left an old soil, one that had been in cultivation for a century and came on to a new soil lying in the forest, and he found that on this new soil the conditions were such that the treatment required was very different from that of the soils he had left, and, therefore, his ideas respecting the use of lime were modified and that use gradually disappeared from the State, so that I don't suppose that 100 tons of lime had been used in the last 10 or 15 years of the period ending 25 years ago.

So thoroughly had we become possessed with the idea that the soil, that all ordinary soils possessed sufficient lime for all purposes, that in planning the experiment with fertilizers and manures at the Experiment Station 22 years ago, we did not think it worth while to make any provision for testing the effect of lime and left it entirely out of our calculations. We had been allowed, after having spent 10 years in learning how to experiment on the location at Columbus, we had been allowed to move the station to a new location, to select a land that seemed to us, from our past experience, especially adapted to the purposes of field experiments, and we there laid out a series of experiments in the use of fertilizers and manures in the hope of learning how to better maintain the fertility of a fairly fertile soil, how better to recover the fertility of wasted soil, for it had been possible for our farmers, in the brief period they had occupied this land to tremendously waste its natural stores of fertility. The farm we selected for our purposes—and we made the selection because we had been criticized for work done on a more fertile soil on the score that work done on that soil at Columbus was not a sufficient guide to the farmer who was living on the poorer soils of the State, therefore we took the pains to select a soil that had been robbed of its fertility by previous management, and we succeeded in securing a farm that had been entered about 90 years ago by a Pennsylvania German family and subjected to the thorough husbandry which the Pennsylvania Germans knows so well how to exercise for some fifty years, during which time an excellent stone house had been built and a large barn and other improvements made showing that the land had been a fertile soil in the beginning. At the end of that period it was sold and purchased as an investment and for 25 years after that it was rented, and when it came into our possession, it showed every evidence of having been despoiled of its fertility; an old meadow upon which we located some of these experiments had been in timothy for several years until nothing was left gradually but five fingers and a few scattering weeds. The wheat stubbles on other portions of the farm were thin, showing a light growth of wheat. We started there and experimented in the growth of corn, wheat, oats and timothy in five year rotations, giving five tracts of land to this work in order to grow every crop each season, and we started with the use of both fertilizers and manure, using different combinations of fertilizers and different applications of common open barnyard manure, a system of economy practiced by the farmers of Ohio at that time.

Dr. Thorne then read the following paper:

LIME AND COMMERCIAL FERTILIZERS IN THE MAINTENANCE OF SOIL FERTILITY.

By DR. C. E. THORNE, *Wooster, Ohio.*

In 1893 the Ohio Experiment Station began a series of experiments in the use of fertilizers and manure on a tract of thin, sandy clay, lying over shaly sandstones from which it had been largely derived, and which had been brought to a very low state of production by three quarters of a century of exhaustive husbandry.

In one of these experiments, corn, oats and wheat are grown in succession, one year each, followed by two years in clover and timothy mixed, making a 5-year rotation. Five tracts of land of three acres each are devoted to this test, each crop being grown every season. The tracts are divided into plots containing one-tenth acre each, and different combination of fertilizers or manure are applied to the grain crops, the clover and timothy being left untreated. Every third plot has been left untreated since the beginning of the experiment.

In planning this experiment no provision was made for the use of lime. At that time the work of field experimentation was in its infancy. The Rothamsted experiments in England had, it is true, been in progress for some forty years, and the experiments at Pennsylvania State College for ten years, but in neither of these tests was there any evidence that lime was needed, and the assumption seemed to be warranted that the supply of lime, like that of iron, sulphur and several other necessary elements of plant food, might safely be left to take care of itself.

But very soon it was observed that the clover crop was misbehaving, the harvest which should have been chiefly clover, consisting mainly of timothy, with sorrel and other weeds. The difficulty was at first ascribed to spring frost having destroyed the young clover plants, and we attempted to remedy it by making two sowings. One spring we sowed three times, and assured ourselves that we had a good stand by careful inspection, and yet when the harvest came the clover was not there. We accused the fertilizers of contributing to the trouble by their failure to add to the organic matter of the soil as does manure; but we found that even on the manured land the clover was not a good crop, although much better than on some of the land where fertilizers were used, or on that left untreated. Every year there would be spots of fair clover, which would be larger when rain was abundant and smaller in seasons of drought, but there was never a satisfactory stand, no matter how well the land was fertilized or manured.

In 1900 we decided to try the effect of lime, and began by spreading quicklime at the rate of a ton per acre over the west halves of all the plots, fertilized and unfertilized alike, the plots being 16 feet wide by $16\frac{1}{2}$ rods long and running east and west. The lime was applied to the land as it was being prepared for corn and was stirred into the surface with harrow and cultivator. The corn was harvested

separately, but showed but little effect from the liming, and the oats and wheat crops following showed so little effect that the limed and unlimed halves were not separately harvested; but when the clover crop came around the effect of the liming was unmistakable.

Some of the results of this work are shown in the table, which gives the average unfertilized yield for all the land and the average increase from a few of the treatments for 13 crops of corn, 11 of oats, 9 of wheat, 12 of clover and 8 of timothy which have been separately harvested on the limed and unlimed land since the beginning of the liming.

FERTILIZERS AND LIME ON CROPS GROWN IN ROTATION.

Treatment	Corn, bus.	Oats, bus.	Wheat, bus.	Clover, lbs.	Timothy, lbs.
Untreated yield per acre,	24.9	27.3	13.2	1,348	2,459
Treated: Increase per acre					
Lime alone,	8.5	3.5	2.1	539	641
Phosphorus alone,	9.8	10.6	8.0	452	391
Phosphorus and lime,	17.6	14.3	10.9	1,233	1,242
Phosphorus and potassium,	17.7	15.5	8.7	880	707
Phosphorus, potassium and lime,	26.0	19.1	11.4	1,963	1,569
Phosphorus, potassium and nitrogen ¹ ,	22.6	21.0	11.6	812	654
Phosphorus, potassium, nitrogen and lime,	33.1	22.7	15.4	2,118	1,972
Yard manure ² ,	31.0	15.1	16.2	2,187	2,253
Yard manure and lime,	38.1	16.9	19.0	3,215	3,371
Lime over fertilizers,	8.4	2.7	3.0	1,049	1,037

¹Nitrogen in dried blood.
²Manure is applied only to corn and wheat. The chemical fertilizers are applied to corn, oats and wheat.

VALUE OF INCREASE, COST OF TREATMENT AND GAIN PER ACRE.

	Value of Increase ³	Cost of treatment	Net Gain	Gain for lime
Lime alone,	\$13 41	\$5 00	\$8 41	\$3 41
Phosphorus alone,	20 64	2 50	18 14	.....
Phosphorus and lime,	36 84	7 50	29 34	11 20
Phosphorus and potassium,	20 65	9 00	21 65	.....
Phosphorus, potassium and nitrogen,	48 42	14 00	34 42	12 77
Phosphorus, potassium and nitrogen,	37 23	17 45	19 78	.....
Phosphorus, potassium, nitrogen and lime,	59 97	22 45	37 52	17 74
Yard manure,	58 91	432 00	26 91	.....
Yard manure and lime,	76 62	37 00	39 62	12 71

³Computing corn at half a dollar per bushel, oats at one-third of a dollar, wheat at one dollar and hay at ten dollars per ton.
⁴Counting manure at two dollars per ton.

The table shows that the lime alone has materially increased the yield on the unfertilized land, the gain from lime alone being nearly

as great as that from phosphorus alone in the corn crop and considerably greater in the hay crops.

When the liming has supplemented the use of fertilizers and manure, it has maintained in the grain crops practically the same additional increase over that produced by the fertilizers that it has given on the unfertilized land, while in the clover and timothy the liming has produced nearly twice the increase on the fertilized or manured land that it has on the unfertilized land. This point has been very conspicuous as the clover has been inspected in the field each season. It has been plainly evident that lime alone is not sufficient to maintain a full growth of clover on a soil so depleted of other elements of fertility as the one under this experiment.

Next to the hay crops, the corn has profited most from the liming, as shown by the last line of the table, and this is what would be expected on the basis of the composition of the crops, for while a crop of clover contains ten times as much lime as an equivalent crop of wheat, it contains only about $4\frac{1}{2}$ times as much as an equivalent crop of corn.

However, the lime content of the oats crop is twice as great as that of wheat, and timothy contains about one-sixth the lime found in clover, so that the composition of the crop does not fully explain its requirement of lime.

On the other hand, when we study the conditions necessary to the maintenance of the work of the micro-organisms of the soil by which the soil nitrogen is converted into forms available to the crops we cultivate, we can easily understand why clover should be first and corn next in profiting by the use of lime. For unquestionably the chief function of lime in the soil is not the direct feeding of the crops we cultivate, but the support of the nitrogen-gathering and nitrifying bacteria, by combining with the nitric acid which it is their province to produce and holding it in a form at once harmless to its producers and suitable for absorption by the growing crop. When the lime supply of the soil is deficient the nitric acid accumulates until it becomes toxic to the organisms producing it, the soil itself becomes acid, and the fixation of nitrogen ceases or is materially reduced.

An acre of corn or of clover contains twice as much nitrogen as an equivalent acre of wheat. Corn is able to secure this large quantity of nitrogen because it grows during the summer months when the nitrifying organisms of the soil are most active, and because the cultivation of the corn assists these organisms in their work by admitting air to the soil, while clover gathers its nitrogen through the aid of the bacteria inhabiting the nodules on its roots. To both classes of organisms an acid soil is unfavorable, and the statistics of crop production in Ohio show that the yield of corn is several bushels per acre lower in the sections where such soils prevail than in the regions where the soil is underlaid with limestone.

Wheat, however, is comparatively indifferent to soil acidity. The largest wheat yields in Ohio are found over the sandstones and shales of the northeastern counties, where the soil is generally acid, a fact which is chiefly due to the larger use of fertilizers in these counties.

The lime was first used in these experiments at the rate of a ton of quicklime per acre, but during recent years finely ground raw

limestone has been substituted for the quicklime. Limestone is a combination of calcium or more commonly of calcium and magnesium with carbon and oxygen. When the limestone is burnt its carbon combines with part of the oxygen and goes off as carbon dioxide, the carbonic acid gas of the older chemistry. This combination constitutes nearly half the weight of the original stone, so that it requires approximately two tons of limestone to carry the amount of calcium and magnesium found in one ton of burnt lime; and since it is impossible to grind the stone to as fine a powder as that produced by burning and slaking we should use at least two tons of powdered stone as the equivalent of one ton of burnt lime.

In slaking, lime absorbs about one-third its weight of water, so that it requires a ton and a third of hydrated lime to carry as much calcium as is found in one ton of burnt lime.

When exposed for a long time to the air carbon dioxide is absorbed, and the lime reverts to its original condition of carbonate of lime.

Lime is not required by all soils, and when used in excess may cause loss instead of gain. This is shown by the experiments at Pennsylvania State College, the soil of which overlies limestone, in which two tons of burnt lime applied every 4 years, in a rotation of corn, oats, wheat and clover, has caused a reduction, instead of an increase, in yield, except when used in connection with yard manure, when the yield was somewhat greater than from the same quantity of manure used in the absence of lime.

One of the effects of lime is to cause a rapid decomposition of the organic matter in the soil by fostering bacterial action, and when the lime is not supplemented by manuring or by such use of other fertilizing materials as will favor a larger growth of crops, and therefore of crop roots, the stock of organic matter may be so depleted as to reduce the yield of the land. Where ground limestone was used instead of burnt lime, in the Pennsylvania experiments, there was a small increase in yield.

In pot tests at the Ohio Station, made on a very acid soil, the yield fell off when burnt lime was applied in excess of seven tons per acre, although ground limestone was used up to twenty-five tons per acre without any sign of injury.

These results show the fundamental importance of lime in the maintenance of fertility, because of its great effect on the clover crop; but also show that lime cannot take the place of other fertilizing elements, but can only perform its full service when associated with phosphorus, potassium and nitrogen, all three; no one of the four can be omitted in the treatment of a soil which has been depleted of its fertility of such exhaustive husbandry as had the one under this experiment.

It does not follow, however, that it is necessary to add lime to all soils. Attention has already been called to the small effect of lime on the soil overlying limestones at Pennsylvania State College. The Ohio Station has a test farm in western Ohio, where the underlying rocks and limestones, and where experiments with fertilizers, manure and lime have been in progress for eleven years. In these experiments, fertilizers carrying phosphorus, potassium and nitrogen are producing practically the same effect that has followed the use of similar fertilizers at the main station, but the increase from lime is comparatively insignificant.

JOINT SESSION OF BOARD OF AGRICULTURE, PENNSYLVANIA BREEDERS' ASSOCIATION, PENNSYLVANIA DAIRY UNION, PENNSYLVANIA HOLSTEIN-FRIESIAN ASSOCIATION AND ASSOCIATED POULTRYMEN OF PENNSYLVANIA.

MEAT CUTTING DEMONSTRATION

PROF. TOMHAVE: If you have a question to ask at any time, don't hesitate, and you will find, as we get along, there will be times when somebody will have to work on this platform. I may be able to get Mr. Bayard to do all of it; if I can, I can keep on talking, but there may be times when I have to make some cuts and you can talk. I can answer questions just as well as not, and if you find, as we go along, that it takes a little extra time, and we apparently may be wasting some time, don't get excited, and we will try and give you something that will interest you as you go along. If anyone has come here with the expectation of seeing a demonstration, so far as skill and swiftness of cutting meat is concerned, I am afraid he or she is going to be very much disappointed, because I am not an expert at this cutting business, and for that reason you will have to endure with me. I believe, however, there are some lessons we can learn as we go along. Furthermore, I believe it is something that we should be interested in, at least to some extent, both as breeders and as meat consumers.

You have heard during the past day or two and during the past two or three years, we are more or less concerned today about our future meat supply. During the past ten or twelve years the supply of meat animals in the United States has very rapidly decreased. In the meantime, the population has increased at its normal rate. The result is that today the meat producing animals on the farms in the United States are far below normal. The result is that we have high priced meats and there seems to be an apparent world shortage of meat. I prepared a table a short time ago to illustrate by a curve the relation between the increase in population in the United States and the supply, or the increase or decrease in meat animals since 1870. I found that from 1870 up to 1900, the four lines, namely, a line of population, a line for swine, a line for sheep and a line for beef cattle, practically ran parallel in an upward trend, but from 1900 to 1907, there was a check in the three lines representing the number of meat producing animals. We find that since 1907 there has been a further decline in all three lines, but especially so far as the number of meat animals is concerned, and yet the line representing increase in population has increased at approximately 2,000,000 souls per year. That means that we are today up against a very serious problem so far as our shortage of meat producing animals is concerned, and it is going to take some time before we can again get back to our normal supply.

Now, we are not only concerned today with the problem of producing meat animals, but we are also concerned with the problem of making the most economical use of the meat animals after we have produced them, after they go to the packer and go to the consumer. While we must consider the producing end of it, yet we should also be familiar with the finished product. I have a number of times made this statement, that I believe our farmers and breeders do not know as much about the packers' business as they should; they do not know the finished product that they are preparing on their farms. They know a good beef animal when they see him and have him on their farm, but they have no conception of the carcass that the butcher and packer gets from the animals they sell. and if there is any one particular line along which we should make some effort to educate or enlighten our people, it is in the matter of know more about the kind of carcass that the butcher or packer gets from the animals which are produced on the farm. You know as well as I do that when you sell a carload of steers, a carload of hogs or a carload of sheep on the market, that you may not get the top price, and especially so in cattle, between the top price and the lower scale, ranging anywhere from \$1.00 to \$3.00 per hundred pounds. Now, there must be a reason for it. The butcher and packer buys every animal on its merit; he buys the animals on the basis of what it will give him after he has taken the hide off, put it in his cooler, and is ready to sell it to the retail butcher, and those are some of the things that we should know something about. The reason for the decrease in the number of our meat animals has been stated so often that I am not going to take the time tonight to dwell on that one point.

I am going to call your attention to one thing, however, and that is, when it comes to the matter of production or the matter of putting on the market, I believe we are wasteful. We are putting upon the market in too many instances animals that do not carry fat or finish enough to command the best price, and they are sold at a loss by the farmer. In other words, if he kept those animals and fed them a little longer, he would make more money; the carcass of such animal would be worth more money to the butcher and packer, and besides that, we would get more pounds of meat to overcome our present shortage.

Now, there are several things which the packer considers when he comes to buying a carcass. In the first place, he buys everything on the basis of 100 pounds live weight; he buys on the basis of quality and on the basis of dressing percentage to quite a large per cent.; in other words, we find that beef cattle when slaughtered, will dress from 42 per cent. to 65 per cent. to 68 per cent.; or, in other words, they will give us from 42 to 68 pounds of meat for every hundred pounds of live weight. Now, those cattle come in this lower scale, those that dress the lower percentage are the ones that sell on the low scale, so far as market price is concerned. You will find that the average run of steers and heifers in good condition will range 55 per cent. to 60 per cent.; those extremely well finished, very fat, run up as high as 65 per cent. to 68 per cent. That is not all. An animal on foot carries a given amount of frame or bone, so that the animal that dresses 42 per cent. on 45 per cent. or 48 per cent. for every 100 pounds live weight carries just as many pounds of bone

as does the animal that dresses 55 per cent. and 58 per cent.; in other words, when the butcher or packer buys an animal that is going to come in this class of higher dressing percentage, he gets that many more pounds of edible meat than he can get from one that dresses to the lower percentage. Now the two carcasses that we have here tonight, one is in just as good condition, an excellent market carcass, one not overly fat, one that possibly could stand a little more finish, yet it is considerably better than many of the carcasses we get. The other is a carcass that comes from an animal that should have remained in the feed lot at least three to five months longer. That animal would have been more profitable to the owner, more profitable to the packer.

As breeders, we must bear this fact in mind, that you cannot take any old thing and make a good meat animal out of it. A meat animal inherits its possibilities from its sire and dam. If you are going to grow beef, you must have upon your place a good pure bred sire that has been bred for beef production, and the same thing is true on the female side. You will find that when these characteristics are inherited from the parents and by judicious care, economical feeding, you can produce beef of the right kind and can do it at a profit. The two carcasses we have here tonight—one is a heifer and one a steer. Some of you will say that is not altogether a fair comparison, but I have taken the precaution to make it fair; that is, the best individual or best carcass tonight is the heifer rather than the steer.

It is through the kindness of the Bengam Packing Company that we can have this material for demonstration work tonight. I believe they appreciate the lessons that we can get from these carcasses and they are only too glad and willing to permit us to have the meat. They also gave me a few figures relative to these carcasses. The live weight of the steer was 993 pounds; dressed, 49 per cent.; not quite half. The live weight price was \$5.57 a hundred pounds. The cost of the carcass as it is here tonight, after deducting the labor or charging the labor, deducting the value of the hide and the fat, cost them \$10.76 for a hundred pounds, dressed carcass. The heifer, live weight, was 1165 pounds; dressed, 54½ per cent. The animal cost \$6.50 on foot. The carcass cost them \$11.14.

Now let's go back and see what the farmer got for these two cattle. It is true, that cattle at the present time are not selling for what they have been selling during the past year, and market conditions are demoralized, but the comparison is the same; it would not make any difference whether they had paid 8 cents for one and 7 cents for another, the comparison would be the same. The light steer returned \$55.31; the heifer, \$75.72, or a difference of \$20.41 on the two carcasses, and there is a difference of a hundred and some pounds, I haven't the figures here, but that would mean a difference of \$11.84 for the additional weight which the man put on the heifer; in other words, he received \$11.84 for every hundred pounds of additional weight that that heifer carried. In other words, we can assume that if that farmer had retained his steer, kept him in the feeding lot and fed him up to the stage that he fed that heifer, he would have received \$11.84 for every 100 pounds of live weight that he would put on over the 993 pounds. When you figure that he would have fed that animal farm grown feeds, he would have gotten

a good price for that feed, economical feeding, he could feed 75 cents corn, \$3.50 silage, \$15.00 hay and 35 cents cotton seed meal, and produce those additional pounds for less money than he would have spent for it; in other words, it would have been more economical for that farmer to have kept that animal on the farm, and besides increased our meat supply.

The lesson we can draw from this is that there are too many thin cattle coming on the market at the present time, and, as a matter of fact, at most times of the year. Animals should stay in the feed lot and be finished out more. The difference in the value of the carcass per hundred weight is 39 cents. Look at it from the packer's point of view, buying these two animals at \$5.57 and \$6.50; this carcass over here costs the packer only 38 cents a hundred more than does that carcass over there. From an economical point of view, from the point of view of the consumer and packer, this is by far the cheapest carcass on the weight basis, yet everyone concerned was benefited by putting out a carcass of that kind. The difference in live weight is 93 cents between the two—nearly \$1.00 a hundred. I wanted you to have those figures so we could know what we are doing. I am going to take these two front quarters first and I want to call your attention to one or two things; in selecting animals on foot for meat animals, we try to get them well developed over the rib and over the loin and to have well sprung ribs, to have that flesh well carried down over the ribs. There is a reason not only from the point of view of the farmer, but the packer, and he is the man who should not be lost sight of. We sometimes find that animals that are not so well flesh, over the ribs and over the loin, will probably make just as many pounds of gain in the feed lot as will an animal well formed or well filled out in these respects. What does that mean? That means that that animal is putting the fat on its side and on the part of the carcass where we don't get the value of the cuts, and the result is that from the packer's point of view, it is not economical and he pays less for that sort of an animal. What he wants is to get a large amount of rib, a large amount of loin, or he wants to get that body weight or dressed weight in the ribs and loin so far as possible. The reason is this, that out of the ribs and out of the loin we get the high priced cuts or the most desirable cuts from the commercial point of view. That chart over there illustrates that point. We find that on the market that the weight of the two loins from the beef represents about 17 per cent. of the total weight of that carcass. They represent, however, 33.66 per cent. of the value of that carcass. The round represents 23 per cent. of the weight and 19.67 per cent. of the value. The chucks, which come, as you notice, out of the fore quarters toward the front of the carcass, a cheaper cut, more bone, more tissue, represent 26 per cent. of the weight and 18.31 per cent. of the value. The plates and other cheap and inferior cuts in the lower part of the carcass represent 13 per cent. of the weight and 9.01 per cent. of the value. The flank, another cheap cut from the lower part of the carcass, represents 4 per cent. of the weight and .89 per cent. of the value. The ribs, another high priced cut, represents 9 per cent. of the weight and 15.47 per cent. of the value. The shank represents 4 per cent. of the weight and 1.49 per cent. of the value. The suet represents 4 per cent. of the weight and 19.01 per cent. of the value; so that the packer has an

object in view when he buys an animal which has well developed ribs and well developed loins, and we must get these things by breeding if we are to supply him with that kind of an animal; that is the reason there is such a difference in animals on the market. He is willing to pay more money for animals that carry the weight in the desirable parts of the carcass.

Now, the question probably arises, "Why is this meat more desirable and more expensive?" The reason for it is that it represents the tenderest part of the carcass and that portion which carries the least amount of bone. You will find that whenever you get a rib out of the center of the carcass or a piece of the loin, as you notice on that chart, you will get a tender piece of meat, providing it does not come from an inferior or old animal. Now, in cutting meat commercially, the butcher and packer makes it a practice to separate the cheaper or thinner cut of meat from the thicker or more expensive cuts of meat. We say we want the animal with well sprung ribs; that gives more surface and more place to put natural flesh. We want him to carry that natural flesh well down over the ribs instead of running at an angle and becoming thin, because, whenever that is the case, the butcher and packer can get a longer rib and it gives him a higher per cent. of that high priced meat, and that is the thing he is after, and he is perfectly entitled to it, because it is a legitimate way of cutting.

Now, the first thing to do is to remove the shank, as indicated on that chart, and we do that so that we can get at the plate a little later on. Now there is a piece that goes for soup bone. I am going to cut the shank off the other one and you will find in these two carcasses, as we go along, that one carries fat enough in practically all parts of the carcass to make it tender, make it juicy and give more pounds of edible meat with every ten or fifteen pounds of meat that you buy. You notice even in the shank now that the thing that we want is to have some fat with the lean. Too many, I am afraid, want all lean. Now, you cannot buy all lean meat and get tender and juicy meat; you must have fat and lean mixed together in order to get quality, in order to get flavor and in order to get tenderness. Comparing these two carcasses, for instance, there, you have one that is practically all lean, this one carries not only fat over the outside, but you notice that the fibre has spread in it some fat. What is the result? The result is that the bundle of muscle fibre in this carcass has been forced apart, that the bundles are forced apart over here, while there they are in close contact, and the result is that that piece over there is tougher than this one. The thing that makes meat tender is the fat that it carries in addition to the lean, and an animal you put in the feed lot will start and put a little fat on the outside, he will put some fat on the inside after he has supplied the outside; then he begins to spread it between these bundles of muscle fibre, and that is the thing that gives you the thickness in the feed lot, it is not that you are putting on a lot of flesh. When you put him in the feed lot to fatten, you are putting on fat rather than any amount of flesh. The animal inherits his flesh naturally. This carcass has fat over the outside, has some on the inside, and has it distributed through the bundles of muscle fibre, whereas, that one over there is practically bare over the entire carcass.

I want to give you a chance to look at the side of these two carcasses. There is what you want to notice. I want you to get the comparison of these two carcasses, so far as the outside is concerned. There you have fat on the outside, and on that one over there in practically every place the bundles of muscle fibre are showing through; it does not matter where we make a cross section, where we cut the carcass, you will find that is the truth. I am going to remove the prime ribs of both carcasses. Now, the place to cut the prime ribs from the plate will depend somewhat upon the thickness of the carcasses. We generally cut where the meat runs the thinnest or keep this bundle of muscle fibre, which we want to use for roasts. When an animal is fleshed over the side, over the ribs, over the side, the butcher can cut you the ribs longer; that is the reason we want that conformation of the beef animal on foot, and you cannot take any old animal of any description and type and make a good meat animal out of him. This is an economical and convenient way of cutting a carcass, though not the only way.

Now, there is a cross section of that plate. Take the plate from the other quarter. We want that thickness carried well down over the side. You will notice when we come to these two carcasses, this one over here is considerably thinner. You can see for yourself the difference that exists in these two cuts of meat. Notice there all along we have plenty of fat, enough to make it a good, tender, juicy piece of meat, even though it comes from the plate, whereas, in this carcass you have little or no fat, which is bound to make that piece of meat tough; yet a great many people go to the market and will buy this piece of meat and then think they are buying meat economically; they are buying more bone and a much poorer quality of meat. You notice, further, that there is only a difference of 38 cents a hundred pounds, so far as the packer's price is concerned, between this carcass and that. The packer paid 93 cents a hundred pounds less for that animal than he did for this one. Now, from his own personal point of view, he paid too much money for that one if he bought this at the right price. If he bought that at the right price, he bought this too low.

Now, the next cut is to remove the prime ribs. I am going to take off the seven ribs, because that will give you some idea of what this portion of the carcass looks like. In cutting meat, there are several rules that we try to follow, so far as possible. One of them is to separate the higher priced or the thicker cuts of meat from the thin or inferior cuts of meat. The second is to cut across the grain of the meat so far as possible, and the third is to use your knife in cutting meat and use the saw to cut the bone because if you try to cut the meat itself with the saw, you are going to gnash it and tear it all to pieces, and if you try to cut the bone with your knife, you will find that the knife will not hold an edge, and besides that, you cannot make a smooth cut. That plate may seem like a suggestion to a kindergarten, but it is not, it is something that a great many people don't stop to realize. We are cutting every one of these cuts, making every one of these cuts in identically the same place. You can see for yourself the difference that exists. This, of course, is a somewhat smaller carcass, yet I could not possibly cut it down lower because it does not possess near the thickness, even there, that this possesses.

Furthermore, you notice the difference in the shape of that bundle of muscle fibre as compared with this. Here you have a V-shaped piece and this line runs almost straight to the tip of the vertebrae down to the side of the rib. In this you have that arch that we desire in the ribs of animals for the feed lot or butcher. Then notice the wonderful sprinkling of fat in that lean. That is the thing that gives you volume, gives you tender or juicy meat, and the thing you should always look for when you go to the meat market to buy a piece of meat and when you are killing an animal for your own use at home; don't take the poorest but take one that is well fed, well finished, and then you have something that you can enjoy and relish. We have here a higher per cent. of the weight of the carcass than we have in this case, yet we have been fair, we have cut this down just as low as we can possibly cut it without getting too much of the thin meat. You will find that that same thing exists throughout the entire carcass.

I am going to remove the lower portion of the shoulder, so as to show you that no matter where we cut, that same relation is found. You will notice there nothing but lean and bone and no fat. Now, let us make a comparison of the ends and make a comparison of these two; notice that beautiful bundle of fat all the way through, fat distributed in that lean gives you the thickness; no matter where you cut the carcass, you will find that same condition exists throughout; yet here is a carcass that costs within 39 cents a hundred pounds as much as that carcass over there; so you see that the packer also buys a carcass of this kind and sells it at a loss, or if he does not sell it at a loss, the consumers that buy the meat are not buying economically. This much must be said: I personally would much rather take a piece of meat from a carcass of this kind that was cut from the plate, from this piece right here, than to take a piece of meat from the prime ribs of this carcass. In the first place, I could buy it for considerable less money; I would find it tenderer, more juicy, more palatable than the piece I get right here, because there we have fat in addition to the lean and it is a more inferior cut and you can buy it for less money; now if you will bear with me for a few minutes, I want to fix up one or two pieces of meat. Possibly somebody has some questions by now. If you have, fire away.

SECRETARY CRITCHFIELD: Where does the piece that in some localities is called "shoulder clod" come from?

PROF. TOMHAVE: It is this bundle of muscle fibre right in there. When you get a shoulder clod, we cannot follow this method of cutting, and the shoulder clod, generally speaking, is taken out of thin carcasses not suitable for cutting roasts and comes right out here or right back of the shoulder where there is a clear bundle of muscle fibre that you can strip from the bone, and that is what is known on the market as the shoulder clod. Now, are there any other questions? Another thing you should bear in mind, holds true with all classes of meat animals, and that is that the tenderest meat is found in the center of the carcass, namely along the ribs and the loin. The further you go towards both extremities, the tougher becomes the meat.

SECRETARY CRITCHFIELD: Well that is probably owing to the fact that there is where the dogs make their attacks.

PROF. TOMHAVE: I don't know how much the dogs have to do with it, but the reason is, I think, that the bundles of muscle fibre along the back contain very little cartilage and connective tissue; they shorten towards both extremities, have considerable more cartilage, bone and connective tissues, due to the fact that there is much more articulation than there is along the loin and the rib. There is practically no articulation there at all.

A Member: What is the age of those carcasses?

PROF. TOMHAVE: I cannot tell you exactly so far as time is concerned, but both are young carcasses. I would imagine from the appearance of the bone that neither is more than 20 or 25 months old. They are both young animals, as you notice from the color of the bone. We can always tell whether or not a piece of meat comes from a young or an old animal by the appearance of the bone. You find that at the tip there is always more cartilage and the bone is more porous and red in appearance. As the animal grows older—an old cow for instance, you will find that that bone, when the backbone is split, it becomes hard, white and brittle. The same thing is true when you cut across the bone at any place, it has the appearance—notice there that red appearance—that is an indication of youth in a carcass. The same is true there. In an old animal, that bone is very hard and white.

A Member: Does the breed of the animal affect the color?

PROF. TOMHAVE: Very little, so far as beef breeds are concerned. When you get to dairy breeds, you find that you have a yellowish bluish color, but so far as the beef breed is concerned, it makes little difference.

A Member: Does the protein have something to do with the color of the meat?

PROF. TOMHAVE: It always does; the protein is necessary in order to develop the muscle; you cannot get the muscle without the use of protein.

A Member: I have killed several Jersey cows myself and get as nice, white meat as anyone.

PROF. TOMHAVE: I'd want to be sure about that. I have killed a good many Jerseys, and although they were fed just like the rest of the cattle, I did not invariably find that underisable color. No matter what you want to do with the carcass, the combination of flesh and fat will always give you the most desirable cuts of meat, no matter what it is used for, whether it is used for hamburger or anything else, you get a much better quality of hamburger from a good carcass than from a poor or inferior carcass. Now I am going to play the role of butcher. I am going to ask you a fair question and I want you to be fair with me; suppose you come into my shop and want to buy a roast for Sunday dinner; I am putting these two out, I have them right on the table like that, and this is labeled 12c a pound and this 14c a pound; how many would take the one on the right hand side? Let's see your hands. How many would take the one on the left hand side? Let's see your hands. How about the

other fellows? Well, there's a few that would take it. Well, how many know what I did? I took the ribs out, yes.

A Member: That assistant of yours knows.

PROF. TOMHAVE: Well, now, I'll tell you what I did; I took that plate or inferior cut from the good carcass and I have it in my right hand; I took the prime ribs out of the poor carcass and I have it in my left hand. How many would buy this in preference to this if I were putting the two out at the same price? How many would take this? Well, there are only one or two and one of them is a dairyman anyway; I know that. But you will find that so far as buying economically is concerned, you can buy almost day in and day out at your shop or any other meat market, this piece of meat for considerably less money than you can buy this piece, and I personally would much rather take this from a good carcass than this from an inferior carcass, and it seems to me that the lesson this thing brings home to us—suppose I had taken this piece and taken out about three ribs and cut them off, why, you would have a beautiful roast and there's a big difference between the two. You notice that is thin, very little meat on the outside, a higher percentage of bone than we get in this rib right over here. Are there any other questions about the forequarter? We will have to move along or we will not be able to get through.

A Member: Which of those quarters would have the most weight of bone?

PROF. TOMHAVE: This one over here would run four or five per cent. more edible meat than we would get in that other one. You take your two animals, for instance if we dissect them, take out all the bone—there's very little more bone in this carcass than in the other one. In the other case it is simply a question of putting on the fat. This one is carrying and building up muscle tissues that is not present there. There is more bone in the other one; there's four or five per cent. more edible meat in this carcass than the other, so there is a higher percentage of bone over there. You will find that the same general relation holds true so far as the hind quarters are concerned. Here again we must remove the inferior pieces or the cheaper cuts of meat from the thicker or more expensive. Now, if you go to the meat market to buy a piece of flank or buy a piece of meat that has that little gland present, don't send the meat back and tell the butcher it's no good, because wherever you find a vein of fat in the animal's body, you will find one of those glands. It may be very small, but it is here; in that bundle of fat we always find one that is comparatively large. Coming to the question of tuberculosis, for instance, the statement is made that tuberculosis may be found in any portion of the beef, for instance, except the hoof and the horns. Sometimes when it is impossible—when you don't find the presence of tuberculosis in the lungs, glands on the lungs, on the mesentery, you may find them in some other portion of the carcass. When you find this gland filled with hard calcareous matter, that's the kind you want to refuse and don't buy it, and don't use it. If you slaughter that sort of an animal and find those conditions present in an animal that is slaughtered on the farm, don't

use it because that is an indication of tuberculosis; but when that gland is perfectly smooth, as this one is, it is all right.

Now you notice in the case of the hind quarter, you have present the udder. When you sell a dressed carcass to the butcher, a heifer carcass, don't cut it off—that is, if it is a cow, don't cut it off, because he will know you have taken it off, so as to try to deceive him; you can't do it anyway and you are simply disposing of some of the weight of the carcass. You notice we have one little gland there, and there is the other, similar to the one I showed you in the other carcass. Wherever there is a vein, you will find those glands present through the entire carcass. That flank is about 50 per cent. fat and connective tissue. The rest of it is a comparatively tough piece of meat, yet notice here, comparing these two flanks cut in exactly the same place, that you have in this one more quality, more fitness. Notice the way the fat was forced through those bundles of muscle fibre—how it has forced them apart, which give you volume, gives you tenderness in that piece of meat, so that it don't make any difference what part of the carcass you make your cut in, you will find that same condition true. If you go to the market to buy a flank steak, this is the piece you get, this pear shaped piece that lies under the udder. Now I am going to cut the loin from the round as indicated over here. Rump and round together make what we call commercial loin, and the loin is the full loin. There are different methods of cutting that, but we shall cut so as to make the cut almost parallel to the back of the round. Now the place to cut this is just at the rise in the pelvic bone and feel for this bone right there. Just cut in front of them and then almost parallel with the back.

A Member: Have you any idea of the weights of those two carcasses.

PROF. TOMHAVE: No, I could not get those figures. They were bought from different parties; no doubt the better carcass cost more money but the man got more money for it. He got \$11.84 more for every hundred pounds put on over the other one, assuming they were both in the same condition at that weight; \$11.84 for every 100 pounds put on over the 900 pounds of the other one. I want to bring these two together so as to make the comparison. You notice that no matter where we make our cuts—see we have taken the loin from the round, cut identically the same place; look at the difference; sirloin steak in both instances. How many people in this audience would not pay five, six and eight cents a pound more for meat of that kind compared with meat of this kind. I think everybody would. How many would be willing to give me 30 cents a pound for this if I sold this at 24 cents? How many would take this at 24 cents in preference to the other at 30 cents a pound? Just one man. Well, I'd like to be near when he got to chewing this. This is the kind we sometimes get at hotels and restaurants where they don't pay very much for meat. This is the kind you get when you order a good sirloin steak. Now the porterhouse steak comes from the center of the loin. Unless you are anxious to see the porterhouse steak, I am not going to cut it. How many would like to see the porterhouse steak? How many would not care to see it? I don't know what to do.

SECRETARY CRITCHFIELD: Don't cut it if you don't care to; you have told us where it is located.

PROF. TOMHAVE: It spoils the loin. I want you to notice one thing; not only do we have that difference when we make our cross section, but let's compare the two. There you have the outside of the two, no matter where we cut, no matter in what portion of the carcass we work, we always find that difference; that is the reason that this carcass over there is so much better than the other one. Notice that layer of fat there. I want to call your attention to one thing, however, this animal was kept in the feed lot and fed until it was very fat, you would find rolls of fat over the outside. We want that fat but we want it uniformly distributed over the outside of the carcass and well mixed in with the lean, then it becomes a commercial product. When we get it in lumps and bunches on the outside, the butcher and packer must sell it as rough tallow. Whenever you get a heavy bunch of fat on the outside over the rib or back of the rump, it means that the butcher must cut that off and throw it into the tallow basket and it goes for four or five cents a pound; whereas, if distributed evenly over the loin, it goes for 35c a pound.

SECRETARY CRITCHFIELD: Is it possible for the butcher to tell how that fat on the outside is distributed before the animal is slaughtered?

PROF. TOMHAVE: Absolutely. You can tell by running your hand over the outside of an animal or even look at him, whether the fat is evenly and uniformly distributed. You ought to be able to tell exactly what is under that hide, and you can only learn that by practice and observation. You take the hide off of an animal and observe the carcass—

A Member: Doesn't it make quite a little difference how the animal is fed—it's putting on fat?

PROF. TOMHAVE: Most decidedly. This one here received possibly nothing more than a maintenance ration, was never fed more than enough to keep up the minimum rate of body growth, to say nothing of putting on a surplus amount of flesh and fat.

A Member: I mean having it in chunks—doesn't it make a difference whether you feed a balanced ration?

PROF. TOMHAVE: Oh, no, that is an inherited tendency.

A Member: Entirely?

PROF. TOMHAVE: Almost entirely. You can eliminate that by breeding and selection. I want to call your attention to another thing. Meat is tough after the animal is first slaughtered, no matter how choice an animal you have. It takes four or five days before there is a breaking down of the muscle fibre. There is a chemical change that takes place in that carcass that makes the meat tender. Now, in order to do that, in order to keep that carcass in good condition, you must be able to let it hang a week or ten days or even longer. Carcasses sometimes hang three or four weeks, before they are disposed of, but a carcass like this would be

all dried up, there would be too much evaporation; the moisture in that carcass would be entirely gone; you would lose too much in weight. This carcass that has fat on the outside, you can hang it in the cellar, leave it there a week or ten days or two weeks. and the meat improves with age, becomes tender, there is no evaporation of moisture because the fat holds up that moisture in there, and even though it ages a little bit, sometimes when you see this mould growing on the outside, take a dry cloth and wipe that off. That removes it absolutely and you have a piece of meat that is tender.

Another thing, I notice the difference in the quality of the kidney fat in the two carcasses. This kidney fat accumulates before the animal puts fat on the outside. You will find when an animal starves to death and all the fat is gone, you will find that the last fat that disappears is that which is found around the kidney. Notice the difference in the covering of those two. You have more kidney fat. It is true that that is cheap and inferior compared to the loin, but you cannot get the good loin and good rib and finish without getting that kidney fat in the carcass. Another thing, I want you to notice the difference in the quality of fat in these two. Notice there how brittle, pretty near as good as butter, this fat is; it is better than some butter. This other fat is springy and tough and has no quality. So it does not matter what portion of the carcass you have worked on, you will find that that same difference exists. Now we will not cut the line further; you can see the two ends over there. Notice that difference in the thickness and volume, that beautiful meat there, and on the other side you have no marbling at all whatever. By marbling I mean the intermingling of the fat.

SECRETARY CRITCHFIELD: Tell us where the tender part of the round is located.

PROF. TOMHAVE: I will cut across that just in a minute. The tenderest portion of the loin is right in here in this porterhouse or the small loin end; we have there the sirloin muscles on the outside and the heavy tenderloin muscle on the lower side of that vertebra. The bone steak that you buy is what is commercially known as the porterhouse steak. Some of you buy tenderloin steaks, occasionally buy it in the hotel; some of you ordered some for supper tonight; you thought you gave yourself a treat, but I'd a good deal rather have a sirloin than a tenderloin steak, because tenderloins are never taken out of carcasses of this kind, they are taken out of the cutters and canners carcasses and the chef is permitted to do the rest. He uses the larding needle and all the rest, but you are not giving yourself such a treat as you think you are.

I want you to notice the outside of the round. Here again we have that difference in covering. Notice that difference in covering. Here we have no covering at all, whatever. That has some fat; that is not covered as much as we would like to see it, but you will again find that the two extreme ends of the carcasses are covered last; you will find that this portion is the last to be covered in a good, choice animal. It's the same way with the front shank. I don't believe I will cut the round to give you the cross section, because they like to sell the round just as I have it cut here, but in answer to Secretary Critchfield's question as to which portion of the round—well, I will cut the poorer one, I will not cut the other one.

The CHAIRMAN: We don't like to cut these, because the gentlemen furnish this meat without any charge.

SECRETARY CRITCHFIELD: It is not necessary to be cut; just tell us which side of the round it is located on.

The CHAIRMAN: We don't like to spoil the meat any more than we have to.

PROF. TOMHAVE: In removing the rump from the round to get your round steak, cut just below this pelvic bone and parallel to it. Now this portion right here is the best portion of that round. This heavy bundle of muscle fiber without very much cartilage and connective tissue—this bundle is smaller, more cartilage and connective tissue than you have on this side, but if you were buying round steak and wanted the best cut out of that round, the nearer you could buy it in the center of this round, the better the cut. In other words, the first two or three cuts from the round are inferior as compared with the fourth, fifth and sixth cut and from there on, as you get down this round, you will find they become tougher on account of this large amount of cartilage or connecting tissue that binds this together. As you get down here, you will find that it becomes almost half cartilage and that it is very tough as compared with the round.

Now any questions you would like to ask about the beef, I will be glad to answer. If you have no questions, we are going to proceed to cut the side of hog which Belcher & Company kindly furnished us. There are a number of different ways of cutting a pork carcass. Most of you may have your own ideas along this line, may have your own method, and no doubt it is a good one. I am going to cut this carcass tonight by what is known as the commercial method of cutting pork carcasses, as the packing house method. That is the most desirable, the most economical method so far as the packers are concerned, and it certainly should be the most economical and most desirable method of cutting for the farmer, because the packer has spent years in working out these problems. Every cent or two that can be saved on a hog carcass runs into hundreds of dollars throughout the year when you consider the large number that are being killed. A great many farmers, after the hog has been slaughtered, insist that the carcass must be cut that same day. Now I do not believe that there is a man here that can make a good, smooth, uniform cut in a warm carcass. I have never been able to do it and I do not believe you can do it, because it is too loose and too flabby. Now you are not so busy that it is necessary for you to get through with that operation that same day. If butchering time comes and your neighbor is helping, slaughter your hogs in the morning and his in the afternoon and go after it the next day and cut the carcasses after they are thoroughly cooled and the meat set. A carcass should always be thoroughly cooled before it is cut up into retail cuts and before it goes to the curing vessel, and we also want it firm and well set.

I requested them to give me a side of hog leaving the head on the carcass, splitting it right through the center. How many in this audience, in splitting your hog carcasses, split it right through the middle of the backbone? Let's see your hands. Quite a number.

How many split it on each side of the back bone, to take out that backbone, or chime as you call it? Let's see your hands? Well, the majority. Now my contention is that this is not an economically way of cutting that pork carcass. You will say "yes, but I must have that backbone, I want to boil it." All right.

SECRETARY CRITCHFIELD: Need it for sour krout.

PROF. TOMHAVE: Yes, very true, but I will show you a little later on, if you take that loin out, take out what is called the commercial or packers' loin, you have more of that meat and you have prepared that loin in a way that it can be used for a roast or for chops and it is used economically. Nature has provided every animal with two sides, right and left. If you split that animal directly in the middle, you will find that the entire carcass is protected on the outside by the hide, there is a thin vellum that separates the two sides, goes down the backbone and down the lower line. If you split that carcass exactly in the middle, you will find that you have left that thin membrane covering all the edible portion of the carcass. I will show you later on why I want you to split it down through the center of the backbone.

In removing the head, we want to cut about an inch back of the ear. You notice it is very easy to remove that head if you do that; try and strike that atlas joint. If the carcass has not been split before the head is removed, you can always strike it. If that cut comes around there just about an inch back of the ear, you will find the atlas joint and head can be taken off without any trouble. That head is used for head cheese, sausage, baked beans or whatever you want to use it for. We have in this carcass the leafard or kidney fat. I asked them to leave the entire carcass intact, which they did, but when you are slaughtering animals for your own use at home or those you are going to sell to the butcher while the carcass is warm, start right at the point of the rib and pull out this leaf lard. There are two reasons for it. One of them is that it comes out so much easier when the carcass is warm and it also aids in cooling the carcass.

Now you probably raise the question, you will say, "Well, it may be all right if the butcher wants it, he is entitled to it, but it is to his advantage to remove it, lift it out, spread it out so that it can cool thoroughly. You will find that you will have little or no trouble with soured loins or soured hams. If this kidney fat is left in as in this case you will find, especially in heavy hogs, that it has a tendency to hold the heat in the loin and in the lower portion of the ham. The result is that frequently that sours and spoils. It is all right for the butcher to have it, he is entitled to it and you should supply him with it, but pull it out, cool it thoroughly, and take it with the carcass, and in spreading this out on the table, put the portion next to the flesh portion of the carcass up. The side that has the thin vellum of membrane should be next to the table. Here again we follow this general method of cutting, namely, that the cutting across the grain of the meat as far as possible, separating the cheaper cuts of meat from the more expensive. Generally speaking the shoulder is cut from the middle, between the fourth and fifth rib, but that cut may vary, depending on the amount of loin you want, and if you want a large amount of loin, you can

cut a short or smaller shoulder. If you want a large amount of cured meat, you can cut between the fourth and fifth or fifth and sixth rib and in that way get more of that meat. There you have a cross section of the shoulder, fat on the outside, that spinal column split practically through the middle. Notice the way that bundle of muscle fiber there is protected. If you cut that on the outside, you would cut right through the center of that and spoil it for roasts right here, and much more so when you come to the loin. Now this shoulder may be cut into what we call a long shoulder or it may be cut into what we call a short shoulder or calf cut shoulder. But before you put this into the curing vessel, remove the rib from the inside of the shoulder.

A Member: What does that hog weigh?

PROF. TOMHAVE: I couldn't tell you, I couldn't get the weight of this hog; I didn't tell the manager to get it for me, so I don't have it. In removing these spare ribs, cut as close to the rib as possible.

The CHAIRMAN: You don't sandpaper the ribs like they do in our town?

PROF. TOMHAVE: Well, you can't blame the butcher for cutting them that way, because he gets more money for the shoulder than he does for the spare ribs. Now these are what is known as the neck spare ribs or the most inferior ribs that we can get out of the carcass. Those that we get from the middle are choicer and more desirable. Now don't put this shoulder into the curing vessel just as I have it there, but remove the scrag ends and use them for sausage or for lye. To put a shoulder into the curing vessel just this way, you will find these scrag ends, after they are through the curing process, have been smoked, become hard and dry and have been wasted, so take your knife and trim the shoulder neatly. The idea is to remove the scrag edges as much as possible. Also remove some of the heavy fat that is found over the back of the shoulder. Now notice how much better that shoulder would be to go into the curing vessel than if you leave the scrag ends and square corners there.

A Member: Do you always leave it that thick?

PROF. TOMHAVE: Yes sir.

A Member: Isn't that liable to dry out?

PROF. TOMHAVE: No. because the deeper you go into the rib you are in the lean constantly and it will keep on drying till you get to the fat and you want to leave as much of this lean on as possible. We leave a covering on the outside of this shoulder. See? Remove the shank in this manner. There is your shoulder ready for the curing vessel. You can use this shoulder for fresh meat, for shoulder steak or for a roast. Very often the top of the shoulder is cut off as illustrated in that chart and we have what we call the shoulder or Boston butt, and then trimming up the balance of the ham gives us what we call the calf cut shoulder; I should not say nam. If we cut about a little better than a third from the top down, that will give us a short shoulder. Now you notice there we have a covering of fat on the outside. That should always be re-

moved and used for lard, if you want a large quantity of lean meat; and in the packing house they are frequently cut this way. Here we have the butt fat; this is what you get if you buy Boston butts. The top of the shoulder is what is commercially known as the Boston butt, and is used for roasts or used for steak or chops, but when you buy this, you should not pay as much as you pay for the chops out of the loin, because it is an inferior piece of meat as compared to the loin portion, because it comes from the front portion of the carcass. The fat then is used for lard. Now if you were to cure this, we want to trim up the edges the same as we did on the full shoulder. There is your calf-trimmed shoulder; a small piece, very convenient for a small family. If you want a large amount of fresh meat, that is the way to trim them it gives you a small shoulder.

Now the next step is to separate or cut the ham from the middle. Now there is no set place to cut that. If you want a large amount of ham, you can cut pretty well towards the loin. If you want only a small ham and a large amount of loin, large amount of fresh meat, you can cut it fairly well back. The place for the back cut depends entirely on the condition of the trade. When the fresh meat trade is strong, when there is a heavy demand for loins and the cellars are fairly well filled with hams and there is not so much demand for hams, the packer is going to cut the loin long, cut close to the ham, but when there is a strong demand for hams, he will cut them longer, especially if there is not much demand for loin. Remove the lower portion of the flank in that manner when you make you cut across here. Do not come across at this angle but cut on this angle, and if the cut is made right back of the pelvic bone at an angle of 45 degrees, this portion is left on the loin and can go as a commercial loin if you are selling it on the market, and it gives you a pound or a pound and a half more of marketable meat. Suppose we cut across there—this would not be fit for chops or roasts and it would have to go for sausage meat. Now that ham is partially trimmed. I remove some of this fat, just enough to keep the outside of the lean covered.

A Member: What would you call that, a bacon type of hog?

PROF. TOMHAVE: No, this is the lard type. A hog that carries as much fat over the back in proportion to the amount of lean is a lard type. Notice the large amount of fat; it would take a considerably larger hog than this one, the bacon type, to carry that amount of fat over the outside. In heavy hogs these hams are frequently skinned; in other words, when there is more fat on the outside of the ham than the cured meat trade demands, that is trimmed off and goes into lard, because it is more economically used for that purpose.

A Member: What breed of hog is that?

PROF. TOMHAVE: I presume it's a Berkshire.

A Member: It hasn't got a Berkshire head.

PROF. TOMHAVE: I will let you speculate on that; he has got the short, chubby ears. Now here you have your ham in this condition. Sometimes in heavy hams we find that it is necessary to take out this bone, but in a medium sized ham in this size, it is not necessary to do so. Now I want to call your attention to this one point; you

notice how well that bundle of muscle fiber along that backbone is protected; notice this spinous process covering it—this fat on the outside. Now, when we split down the side of that backbone, that is just about where you make your cut, isn't it? Or do you cut down a little bit further like that?

SECRETARY CRITCHFIELD: About there.

PROF. TOMHAVE: All right now, that's what you do; then you leave the entire backbone in one piece; you have a small amount of meat on each side; you haven't a piece that you could carve when it comes to the table, because the vertebrae are held intact. Further than that, you put that piece of meat in the oven to roast it and you will find that instead of having the juices in the meat when you get through, they are in the dripping pan and that bundle of muscle fiber is hard and dry, because the whole thing has been opened up and you are losing a large amount of nutrients, besides which you are reducing the palatability of that piece of meat.

Now, take that heavy bundle of muscle fiber right there; it is exposed and if you put it in the curing vessel it comes out hard and dry and you are not making the most economical use of that piece of meat. Now, then, in curing meat we want to expose as little of the lean as possible; the lean portion, such as the loin, should always be used as a fresh meat product. There is a certain trade, and it is very limited at that, English trade, that demand that sort of a cured product with just the center of the backbone taken out, but that comes from a light hog and there they cure the hams and the bacon and the shoulder all in one piece or sometimes with the shoulder removed. There is a very limited trade that demands it and the packers to-day are cutting the hog's carcasses by taking out the commercial loin because it is by far the most economical method of cutting it. The way you do that is to separate the loin, as indicated on that chart, from the bacon strips or the middle right there where we find that break in that bundle of muscle fiber, and make that cut something like that on that end. On the other side, we cut just below that heavy bundle of muscle fiber, then make the cut parallel to the backbone, with the result that we have here the loin with its fat back. Don't take this and let it go into the kitchen in that manner, don't take your knife and cut or chop off that end or a roast or whatever it may be and ask the good housewife to use that for a roast, because there is too much fat there and in this day and age we don't require, we don't care for as much fat as our forefathers. This fat should be taken from the back of the loin and cut up for lard. You will find that the average farm home never has any over-abundant supply of lard. Take that fat off the back of the loin, just leave enough there for a covering and put it in the lard kettle and you will get more out of the carcass and the housewife will appreciate it a good deal more and you will find that the youngsters will not be compelled to cut off this piece of fat and put it at the side of the plate, which they are bound to do if you try to make them eat it.

A Member: When we take that middle strip out, we get it all at once.

PROF. TOMHAVE: We will come to that in a minute and I will show you where you are losing out. In the packing house they have what they call a draw-shade that takes this fat off of one piece that is made to fit the back of the loin. Since we don't have one of those here, we will have to do the best we can with this knife, but when you remove this and must mutilate one or the other, mutilate the fat back portion because that is going into the lard kettle. I left a little too much fat on there.

SECRETARY CRITCHFIELD: The Jack Spratts are not all dead yet

PROF. TOMHAVE: I know, but they are too few and far between. Now you notice here we have the fat back taken off, nothing but fat, just a little sprinkling of lean there, but notice how much better it is to put this into the lard kettle than to try to make the boy or girl or even yourself eat it. You don't care for it, some of you may think you do, but you really don't.

A Member: We used to.

PROF. TOMHAVE: Yes, but you don't any more. Twenty-five years ago you would think nothing of taking that whole loin and cutting a piece off and eating that fat, but you don't eat it to-day, you have passed that stage. Now here we have a commercial loin. I am sorry that I haven't a small cleaver, I asked for a cleaver and they sent me a splitting cleaver, but we will get that all right. Now there you have that beautiful bundle of muscle fiber over the back of the loin, protected from every side. Notice this rib on the inside, this spinous process there that layer of fat on the outside. You can put that into the oven and roast it and retain all of these juices, but if you cut right through there, you have mutilated that beautiful piece of meat, you are putting this choicest portion of the carcass into the curing vessel, drying it up and wasting a very choice and palatable piece of meat, whereas, if you leave it in this manner, you can prepare it for roasts, you can prepare it for chops, and put a piece of meat on the table that you can carve with pleasure. When you cut this cut, as you say you do, you have the other side in exactly the same condition. The result is that these vertebrae, held together as they are, it is impossible to get to them and separate them so that you can carve through and cut across the grain of the meat. Your wife will tell you that the way to carve meat is to cut across the grain of the meat. If you were to carve this loin, you would want to cut across this way, but you cannot do it where that line is left entirely intact on both sides.

Now, what you want to do is to take a cleaver, if you happen to have one, and if you do not, take a hatchet or take an axe and just break through the back of these vertebrae. You notice there in one place where I cut in too far, the muscles are all cut so that when you put that on the table and start to carve there, you can get through that rib, which is impossible if that loin is left intact. You can sear this end, turn it around and sear the other end, put it into the roasting pan and there is absolutely no chance for the juices to escape, and when that pork roast comes on your table, you will have something you will relish; it is not hard and dry. All the moisture it contains is kept in there, and that is what we want and that is

the thing that makes a piece of roast desirable. If you were to cut this up for chops—now another thing, just think how much more you would enjoy a nice pork chop like that than to have it cut off there, with that bone in the center coming from both sides, a little piece on the outside, a very small amount of meat there and mostly bone, have a pick a little off on each side; but when you have this chop all intact, look at that beautiful bundle of muscle fiber, how much more attractive it is, and you will get more enjoyment out of it and certainly you are making a much more economical use of the carcass than where you split right down the backbone.

Some of you are interested to know where the tenderloin is found. There, notice that beautiful piece of meat. This is the portion that comes right out of that portion of the carcass and corresponds to the porterhouse steak of beef. Your heavy bundle of muscle fiber or the sirloin muscle on the outside, the tenderloin muscle below that bone—notice how that is separated. If I'd cut a little further down there, we would have that same T-bone we get in the case of steak.

SECRETARY CRITCHFIELD: That is what we call the fish.

PROF. TOMHAVE: Yes tenderloin is a nice piece of meat, I admit, but you get so much enjoyment out of eating it when you eat a sirloin and tenderloin together.

A Member: When you put the tenderloin in sausage, how do you cut it then?

PROF. TOMHAVE: You don't want to put the tenderloin in sausage; take the trimmings, the more inferior parts, for sausage.

A Member: Down our way, practically all of it is put in sausage.

PROF. TOMHAVE: The whole hog?

A Member: All the tenderloin.

PROF. TOMHAVE: Then you are putting into sausage the best piece of meat you are getting out of that whole carcass.

A Member: It makes better sausage meat.

PROF. TOMHAVE: I'd rather have mine fresh.

A Member: What part do you put into scrapple?

PROF. TOMHAVE: Generally trimmed portions, portions from the head and pieces of that kind go into scrapple, the trimmings. When you remove these ribs, cut just as close to the ribs as you possibly can. There are what we call the prime spare ribs. If you want to buy spare ribs, these are the ribs to buy rather than those I took from the neck, because these are more tractable and other choicer ribs. You notice here there is that beautiful layer of lean over the outside. Very often people will insist on putting meat into the curing vessel with these ribs left on. Take them off, remove them from the middle portion, because they can be used to such better advantage while fresh than where they pass through the curing stage. Before you trim this up, put it into the curing vessel, take a flat instrument of one kind or another, take a cleaver and flatten it out. In the packing house you probably notice they have a hydraulic press that

comes down and straightens out every one of these side pieces, because there are bound to be wrinkles running lengthwise on the outside of that pork carcass from hanging up, and those you want to remove, but don't get the idea that you can remove wrinkles that run up and down the outside of the hog in that manner. You will find when you have wrinkles running up and down, back of the shoulder, that you cannot get rid of them. You will not only find them on the outside, but when you cut the bacon strip, you will find that there's an unequal distribution of fat and lean and that is the thing that is objectionable. If you want a large amount of bacon, just square up the edges in this manner, take off this lower strip. Now this will all go into the lard and sausage. Here you have the bacon strip neatly trimmed. Leave that in one piece or cut it into two pieces just as you like and put it into the curing vessel. You notice at this end, this flank end, there is not as much lean as there is on this end, consequently the choicest portions of the bacon comes from this part from which the ribs have been removed for premium bacon. Take medium weight hogs and cut the bacon short to about there and this goes for salt pork and that gives you premium bacon that will sell for three or four cents a pound more on the market.

That completes the work of cutting the pork and the beef carcass, and I hope that I have not detained you too long. I don't know what time it is, but I want to thank you for your indulgence and your patience.

A Member: Say a few words in regard to curing.

PROF. TOMHAVE: There are a number of different methods of curing and possibly some of you have a better method than I know of. In brief, first of all, your meat should be thoroughly cooled. That is the first essential.

A Member: It is not desirable to let it freeze?

PROF. TOMHAVE: No. sir, the freezing of meat and keeping it frozen does not injure it, but don't freeze a pork carcass that is to be put away to be cured unless it is necessary. It won't hurt it if you freeze it and keep it frozen until you cut it up and thaw it out and put it into the curing vessel. It is not the best thing for it, but alternate freezing and thawing of meat breaks down the muscle tissue and causes the meat to become flabby. Cool the carcass as rapidly as possible have it firmly set, trim the pieces of meat up as these are trimmed, and it will be ready for the curing vessel. The recipe that we have so many of us used and have found satisfactory, is one made up, 8 to 10 pounds of salt, 2 pounds of brown or granulated sugar and 2 ounces of salt peter for 100 pounds of meat. That, dissolved in 4 gallons of boiling water. I will give it again so that if any of you want to take it down, you can do so. Eight to 10 pounds of barreled salt; 2 pounds of sugar, brown or granulated, and 2 ounces of salt peter. That is the mixture for 100 pounds of meat. This is to be dissolved in 4 gallons of boiling water. That solution is then set away and allowed to cool. In the meantime, take some salt and rub the outside of your meat. Suppose this is a piece you want to cure; take some salt and thoroughly rub it on the outside, so as to draw out any particles of blood that may be near the surface in this meat. Some of you may wonder why we want to use these various ingredients. The use of salt is a means of preserving; that

is the reason we use it in such large amount but the action of salt alone on meat has a tendency to harden muscle fiber, and for that reason we use the sugar. The addition of sugar has a tendency to soften the muscle fiber and besides to give it the sweet taste. The use of the salt peter is not as a preservative; it is a preservative in itself, but we use that very small amount, two ounces for every 100 pounds of meat, as a means of retaining the natural color in that meat. You will find that salt not only has the astringent effect of hardening the muscle fiber, but also removes the natural color of flesh and that is the reason we use the salt peter. We leave it in the liquor five to seven weeks, that is long enough, five to seven weeks, depending on the size of the piece. That is for a brine cure. If you prefer a dry salt cure, we use the same combination except that we don't use as much salt. We use five or six pounds of salt instead of eight to ten, but personally I prefer the pickle cure because it requires less attention after you have put it into the curing vessel. With the dry salt cure you must rub the meat at the end of five or six days. Although it is a quicker method of curing, yet it is not quite as economical as the other method of curing.

A Member: How long do you let it lie to cure it dry?

PROF. TOMHAVE: Two or three weeks; it cures quicker that way than the other.

A Member: Why do you boil the water?

PROF. TOMHAVE: The reason is that any foreign matter that may be in the water coming out of a pump or spring will generally come to the surface and can be skimmed off, and boiled water is more sterile than water directly from the pump. Beside that, you have dissolved your ingredients much quicker than you can in cold water. These are the minor reasons for it.

A Member: Do you put it on the meat while it is hot?

PROF. TOMHAVE: No sir. Always have the solution thoroughly cooled before it goes over the meat. You will find that four gallons of water is enough to cover 10 pounds of meat if thoroughly packed in a barrel or jar. If you do not have the meat thoroughly submerged, add a little more water to it. Put boards over it and a good clean stone and you should have little or no trouble with your meat, and put that vessel in a cool place where it will not freeze or become too warm.

A Member: Does it make any difference in the quality of the meat produced by rather hard feeding?

PROF. TOMHAVE: It depends upon the feeding, of course, and the surroundings. Filthy and undesirable conditions in a small lot would be undesirable as compared to a larger lot with greater freedom and more sanitary conditions, but the quality is based on breeding and feeding rather than environment. If the animal is well taken care of in close quarters, there will be very little difference, so far as quality is concerned, though an animal in the feed lot needs to be taken care of just as much as an animal used for breeding purposes.

A Member: That is what I meant; shouldn't it have exercise?

PROF. TOMHAVE: Yes, exercise has a tendency to do that to some extent, but to what extent we don't know.

MR. STEVENSON: Couldn't you do that by forgetting to feed the hog every other day?

PROF. TOMHAVE: I am afraid not. The hog is like the human person, he wants his meals as regular as you want yours, and for that reason he should have them.

A Member: Does it do any harm to stay in pickle a longer time?

PROF. TOMHAVE: No, it does not. Are there any other questions? If there are no further questions I want to thank you.

REPORT ON FORESTS AND FORESTRY

By MIRA C. DOCK.

Owing to the very recent date of my appointment to this honorable Board, I ask your permission, to accept from me instead of a report, a memorandum on projected work, which I hope will receive not only approval, but valuable suggestions from the Board.

The memorandum relates to both general and special means of re-foresting waste farm lands and hilly woodlands in our State. Every one who travels considerably in our State has doubtless observed the increased extent of cut-over hill lands, as for instance the north and south boundaries of the Chester Valley, and other rich agricultural valleys; the increased number of washed and gullied fields in the rolling farm lands of Dauphin, Northumberland, Huntingdon and other central counties, and also the vast destruction by means of sleet, storms and floods in recent years, of trees bordering streams. The general work for which I ask your approval is active co-operation with the State Department of Forestry in promoting a movement for extensive and general re-forestation of private woodlands under the provisions of the Auxilliary Forest Act of 1913, copies of which are appended:

No. 269.

AN ACT

To provide for the assessment and taxation of auxiliary forest reserves, and the collection, distribution and use of the taxes collected therefrom.

Section 1. Be it enacted, &c., That all surface lands which may hereafter be classified and set apart as auxiliary forest reserves, in the manner provided by law, shall be rated in value, for the purpose

of taxation, not in excess of one dollar (\$1.00) per acre and shall continue to be so rated so long as the said land remains within the class designated as auxiliary forest reserves: Provided, however, That if the said surface land be underlaid with coal, iron ore, oil, gas, or other valuable minerals, said minerals may be separately assessed. The assessors in the several districts in which such lands are situate shall assess such lands in the manner now or hereafter provided for the assessment of real estate for purposes of taxation, as if they had not been set apart as auxiliary forest reserves, and shall make their returns to the county commissioners in like manner as is now or hereafter may be provided by law, subject to exception, appeal, and final adjustment.

Section 2. Upon receipt of assessment returns from the various assessors, the county commissioners shall reduce, in their records, to a sum not in excess of one dollar (\$1.00) per acre, the assessment on all those lands which shall have been placed in the class known as auxiliary forest reserves, in accordance with certificates filed with them by the State Forestry Reservation Commission, and the original assessment returns made by said assessors shall be preserved.

Section 3. Whenever timber, on land which is included in the class of land known as auxiliary forest reserves, is about to be harvested, the then owner of the timber on said land shall give a bond to the county treasurer in twenty per centum of the amount of the estimated value of the timber to be harvested, and to be approved by the court of the county, conditioned to pay to the county treasurer, within ninety days after harvesting, ten per centum of the value of the trees immediately at and before the time of harvesting; which amount shall be ascertained by statement and return, under oath or affirmation, furnished in triplicate one to the county commissioners, one to the county treasurer, and one to the commission, immediately after harvesting, by the then owner of the land, setting forth said value; which sum thus paid shall be divided and distributed by the county treasurer of each county—to the county, and to the poor district, the road district, and the school district of the township in which the auxiliary reserve is situate, pro rata, based upon the last assessed millage of taxation for county, poor, road, and school purposes within said taxing district.

Such sum of money when ascertained to be due as a tax by the filing of the foregoing statement and return, under oath, and, as hereinbefore provided, directed to be paid to the county treasurer by the owner of an auxiliary forest reserve, shall, from the time of such filing, be and remain a lien upon the land of such owner until payment shall have been made: And be it further provided, That all moneys received by the boards of supervisors shall be appropriated exclusively to the opening, maintenance, and repair of the public roads now or hereafter passing through or into said auxiliary forest reserves, or upon which said reserves now or hereafter may abut; and, in the event that no public highways pass through or into said reserves, or none of said reserves abut on such highways, then said moneys shall be used for general township road purposes.

Section 4. Should the county commissioners be dissatisfied with the return made, as hereinbefore provided in section three thereof, the court of common pleas of the proper county, on petition of the commissioners, shall appoint a board of three appraisers, who shall

go upon the land in question, estimate the quantity and value of the trees immediately at and before the time of harvesting, and make a return thereof to the court, which said return shall then be made the basis upon which each owner shall make payment to the respective county treasurers, unless changed upon appeal. The said appraisers shall be duly sworn or affirmed before entering upon their work, and either party, if dissatisfied with the report of the appraisers, shall have right of appeal to the court of common pleas of the county, within ten days after such report shall be filed and notice thereof given the owner. The said appraisers shall be allowed their expenses and a compensation to be fixed by the court, both to be paid by the county commissioners.

Section 5. In case of the removal of said lands from the class known as auxiliary forest reserves, prior to the maturity of the timber, and without payment of the tax of ten per centum of the value thereof, as provided in section three of this act, the county commissioners shall, on notice from the commission, ascertain the amount of the taxes which would have been paid by the said owner on the original assessment, before the reduction provided for in section two of this act, adding legal interest from the date when each tax payment would have become delinquent. The said commissioners shall likewise ascertain the amount of taxes which have actually been paid upon the land in question, adding legal interest upon all such payments from the date when paid, and certify the result thereof to the county treasurer, who shall then proceed, in the manner provided for the collection of county taxes under general laws, to recover from such owner the difference between the two amounts, with costs. Such difference, so ascertained to be due as tax as aforesaid, shall be and remain a lien upon the land of such owner until payment shall have been made.

If such land shall be so removed from said class after the due cutting of a matured crop and the payment of tax thereon, the owner shall, in that case, not be liable for such past assessment but the land shall thereafter be liable to assessment and tax as all other land not classed as auxiliary forest reserves.

Section 6. This act shall take effect only beginning with assessments made for the purpose of levying taxes for the fiscal year one thousand nine hundred and fourteen.

APPROVED—The 5th day of June, A. D. 1913.

No. 270.

AN ACT

Providing a fixed charge on land classified as auxiliary forest reserves; and the distribution of the fund thus set aside for school and road purposes.

Whereas, By existing law the State forest reserves are subject to an annual charge of two cents per acre for the benefit of schools, and two cents per acre for the benefit of roads, in the respective districts in which said reserves are located; and

Whereas, It would be a hardship to withhold from school and road districts the taxes which would otherwise be collected from land classified as auxiliary forest reserves; therefore,—

Section 1. Be it enacted, &c., That all lands which shall hereafter be classified as auxiliary forest reserves shall be subject to an annual charge of two cents per acre for the benefit of the schools, and two cents per acre for the benefit of the roads, in the respective districts in which said reserves are located. Said charge is hereby made payable by the State.

Section 2. The State Forestry Reservation Commission shall certify to the respective school districts and road districts, throughout the Commonwealth, in which auxiliary forest reserves are located, the number of acres thus set apart and classified in each district, and the charge against the same; and shall, furthermore, certify to the State Treasurer the number of acres as aforesaid, and the charge against the same, in favor of the respective school and road districts. The State Treasurer shall, upon the approval of the proper warrants of the commission, pay to the several school districts and road districts the amount due the same from the Commonwealth, as derived under this act.

APPROVED—The 5th day of June, A. D. 1913.

No. 284.

AN ACT

To classify certain surface lands as auxiliary forest reserves; to prescribe the terms and conditions for their continuance in said classification, or their withdrawal therefrom; and to provide for the expenses attendant thereon.

Section 1. Be it enacted, &c., That in order to encourage the growing of such trees, now existing or hereafter produced, as will at the proper age be suitable for merchantable forest products, whether such be of natural reproduction or from seed sown, or trees planted out, or all combined, all surface land which may be set apart according to the provisions of this act, and exclusively used for growing such trees, is hereby constituted a separate and distinct class of land, to be known as auxiliary forest reserves.

Section 2. When any owner of surface land desires to have such land placed in the class established by section one of this act, such owner shall notify the State Forestry Reservation Commission of his desire in manner and form to be prescribed by said commission. Said notice shall contain a description of the land, its location, boundary, area, and character, and shall state as far as practicable the species, character, and condition of the trees growing thereon, and whether they are of natural reproduction or are from seed sown for the purpose, or have been set out of said land, or all combined, and such other information as the commission may require. If, upon receipt and consideration of this notice, the commission shall, in its discretion, deem the conditions such as to warrant action on its part to determine whether such land should rightfully be placed in the class established by section one of this act, it shall cause the

same to be examined by some person learned in the practice and principles of forestry, and a report made thereon, and if, upon receipt and consideration of such report, it decides that such land should be placed in the class established by section one of this act, it shall so declare and certify to the commissioners of the county in which said land is located.

Section 3. Upon receipt by the county commissioners of such certificate of the commission it shall be their duty at once to place said surface land in the class established by section one of this act, and keep the same therein until the trees growing thereon shall, in the judgment of the commission, become sufficiently large and suitable for merchantable forest products, or the land be devoted to other purposes: Provided, however, That the certificate of the commission shall not become operative to place said surface land in the class established by section one of this act until the owner of said surface land has agreed, in writing, with the commission to care for the trees growing thereon, according to the instructions and directions of the commission, up to such time as such trees become suitable for merchantable forest products; and if any such owner at any time fails to care for the trees growing on said land as agreed with the commission, and due proof thereof is made, the commission may remove said surface land from the class established by section one of this act. In case of such removal, either through failure of the owner to care for the trees or on his expressed desire for removal before the trees shall have been cut at maturity and tax paid thereon, the county commissioners shall, on notice from the commission, proceed to recover from said owner, for the use of the county and township, by an appropriate action at law if necessary, the difference in the amount of tax which would have been paid by the said owner at the rates established for the years for which recovery is sought and the rate provided for auxiliary forest reserves, with costs of suit, to be recoverable from the time when such land was placed in the class of auxiliary forest reserves. And the commission shall remove said surface land from the class established by section one of this act at any time that the then owner shall, in writing, notify the commission that he desires such removal. The commission may, in its discretion, at the time said surface land is placed in the class established by section one of this act, require the owner to file with the commission his or its bond, of such kind and amount as the commission shall deem reasonable and sufficient to secure the obligations of such owner under this act.

Section 4. Whenever trees growing on said surface land have become suitable for merchantable forest products, the commission shall, at the request of the owner or on its own motion, make an examination of said land, and designate for the owner the kind and number of trees most suitable to be cut, if, in the judgment of the commission, there be any, and the cutting and removal of said trees so designated shall be in accordance with the instructions of the commission.

Section 5. If the owner of said surface land faithfully carries out the instructions of the commission with regard to the removal and marketing of such mature or other trees, as may be designated in the instructions of the said commission, and shall immediately re-plant other trees of valuable species, or so protect the young growth

that the said land may immediately become covered with young forest growth, and does so with the approval of the commission, then such surface land shall remain in the said class, established by section one of this act; otherwise, the commission shall notify the county commissioners that the said land is not being maintained in accordance with the written agreement of the owner and the instructions of the commission, in which event the county commissioners shall immediately remove said land from the class established by section one of this act. All expenses attendant upon the examination of the said surface land by the commission shall be paid for out of the moneys appropriated for the maintenance of the Department of Forestry, in like manner as other expenses for maintenance of said department are now paid.

Section 6. The owner of the said auxiliary forest reserves shall, at all times, have the right to remove therefrom trees, or portions of trees, which may be killed by fire, thrown or broken by the wind, or injured by other natural causes; and shall, under the direction of the commission, be privileged to make necessary thinnings or removal of undesirable species of trees, in order to improve the condition of the remaining trees; and, under the same direction, may be privileged to remove therefrom such timber, from time to time, as may be necessary and essential for use upon the neighboring cleared lands of the said owner, for general farm purposes.

Section 7. Any tract of land while remaining in the class of auxiliary forest reserves as above provided, may, nevertheless, be sold or incumbered by or through the owner thereof, but no sale or incumbrance, whether voluntary by the owner or involuntary under any statutory or judicial proceeding whatsoever, whether of any State or of the United States, shall effect a discharge of any obligation imposed under this act, and said land shall be removed from said class only in accordance with the provisions hereof.

Section 8. That all acts or parts of acts inconsistent herewith be and the same are hereby repealed.

. APPROVED—The 5th day of June, A. D. 1913.

These Acts relate more especially to tracts of considerable extent, such as the hills mentioned above, from which, as a rule, all valuable kinds of timber have been removed, and which, in many instances, are decreasing in value from lack of care, which adoption of the Forest Acts would insure them.

The special form of re-planting, for which I ask your approval and suggestions as to how a movement can be urged forward, is the planting of nut trees, either hickory or walnut, on lands adapted to them, of white oak and ash on stream borders, and of red and rock oak, especially the latter, on the rocky hill-fields of many, indeed, most portions of our State. Fine examples of the rapidity of walnut growth can be seen on the Fox Estate, Clarion county; along Penn's Creek, near Glen Iron, Union county; of ash, growths of four feet per annum have been noted at Asoph, Tioga county. The growth of hickory is slow everywhere, but because it is slow we should plant it all the sooner. Red and white oak grow very rapidly in some localities, and rock oak on the dry soil of steep hills in Adams county grows like a weed in height. I am indebted to the Hon. S. B. Elliott

for the exhibit of a plantation of Norway Spruce planted by him in 1867, and which in 1903, at the age of 36 years were 65 feet high. I have seen these trees and they are now really monumental in size. Another exhibit is a white pine grove of trees now 6 to 12 feet high raised by me from seed gathered in 1901; they are good but not extraordinary. The third photo is of Colorado Blue Spruce, with white ash in the background in one of my own nursery rows. These trees are raised for experiment, and from my own experience, I urge every one who lives in the country to start this spring to raise their own trees, with which to improve with valuable species some now worthless corner of their woods, or to bring variety and a new interest into their planting. But that we shall all co-operate earnestly to promote a re-forestation movement in our State is my earnest hope. We have the land and the machinery and all we need is the will to do.

REPORT ON SOILS AND CROPS

By PROF. FRANKLIN MENGES

This is a new departure with the State Board of Agriculture. We have had reports on well nigh all agricultural and allied subjects, but so far as I have been able to learn, never a report on soils, climatic and crop adaptations.

The State of Pennsylvania has as varied soil and climatic conditions as any of the Eastern states. The southeastern part, more especially the counties east of the South Mountain, with an elevation nowhere about six hundred feet above tide, have a growing season ranging between the last killing frost in the spring and the first killing frost in the fall of 200 days, while in the same altitude, on Somerset county, at an elevation of 2,200 feet, the season between killing frosts averages only approximately half that of the southeastern section; and west of these high elevations in Fayette, Westmoreland, Washington and Greene counties the growing season is approximately one-third to one-half longer than on the high plateau of the Allegheny Mountains. With these shortened seasons, the crops raised in Somerset county and the crop rotations followed are very similar to those of the southeastern and the areas west of the Alleghenies.

The question at once arises, Is this practice the best or is it justifiable and will it bring the best results, or can we utilize crops better adapted for these higher elevations and cooler climate and can we devise a rotation of crops by means of which advantage can be taken not only of the season between killing frosts of hot weather plants and the season when plant juices of cool weather plants no longer freeze in the spring and until they begin to freeze in the fall and all growth stops? Plant growth is nothing more than the storing up of sunlight, and there are varieties of plants which can store up sunlight during cool and even frosty weather or until the plant juices

freeze, while others cannot endure cool nights, the plant juices of which congeal and are permanently injured by the lightest frost. All the varieties of wheat, winter and spring rye, oats, barley, spelts, are cool weather cereals, while all the varieties of corn and the sorghum are hot weather cereals. Red alsike, crimson, sweet, white and numerous other clovers, together with some varieties of alfalfa, Canada field peas and a large variety of other peas, and some beans, are cool weather legumes, while mammoth clover, some varieties of alfalfa, the various varieties of cowpeas, soy or soja beans, belong to the warm and hot weather legumes. In many of the sections referred to both the cool and hot weather cereals and the cool and hot weather legumes are indiscriminately raised.

As previously stated, plant growth is a process of a storing sunlight and the farmer, therefore, through the agencies of the plants he raises, is a storer up of sunlight in such a condition that it will furnish the largest amount of the most available human nutrition; and the question will ere long be, What plants will furnish the highly available human nutrition in the largest quantity under the varied climatic and soil conditions. Wheat and corn are first among the cereal grains as gatherers and storers of large amount of available human nutrition containing, especially wheat, all the elements of nourishment required by the human body, the former a cool weather crop which starts its growth in the fall of the year at a season when corn will no longer grow, and starts in the spring, weeks and sometimes months before corn is planted, in fact develops and ripens a crop by the time corn gets well started. A climate in which the temperature during the season of stalk and grain development ranges from 65 degrees—80 degrees Fahrenheit, with an amount of moisture that will produce not a luxuriant, weak, sappy stalk but a stiff stemmed, strong one is the most favorable for the production of large yields of high milling quality wheat which will make a large quantity of flour of a fine bread making character, while the temperature most favorable for the development of a stalk that will produce and ripen the largest yields of corn, ranges from 80 degrees to 98 degrees Fahrenheit during the greater parts of the months of the middle of June, July and August, with a rainfall of from six to eight inches during this period, is the most favorable for the production of large yields of high feeding quality of corn. The luxuriant growth of stalk in which too much energy is put into straw and not enough into grain is usually due to too much rain and sunshine, or at any rate, too much moisture and a temperature at which stalk growth can go on, which is the case in the higher elevations of Somerset county, with favorable cool climate but with an excessive rainfall reaching 55 inches during the year because of which the rain accomplishes what the heat and moisture do in other sections.

But soil conditions favorable for the production of a superior wheat are equally as important as climatic. The warm early farmings, sandy loams and loamy soils derived from the Potsdam sand and micaceous rock of the South Mountains also produce large yields of high milling quality wheat, because these soils are warm with no excess of rainfall and not an excessive water holding capacity. Plant growth begins early and the wheat plant is grown and the grain developed during the cooler days of early June and ripened during the middle of this month, while in the cooler loams, clay

loams, and clay of Cambrian limestone origin, a luxuriant straw growth is made, the grain developed later and ripened during the latter part of June and early July and an inferior milling quality wheat produced by soil types that will yield a superior quality of corn, an illustration of soil and climatic adaptation for different cereals.

Bradford, Tioga, Susquehanna and Wayne counties have similar climatic conditions as those prevailing on the elevated areas of Somerset county with a smaller amount of rainfall which makes conditions here more favorable for raising the cool weather cereals, such as wheat, than Somerset county, a crop which formerly was grown in these counties and which with the right agricultural methods could at this time be successfully raised and it seems should be raised because of its value as human food. But oats is without question the best adapted cereal for these northern and higher elevated areas especially where the rainfall exceeds 40 inches and where this cereal can, with right agricultural methods, be made to yield from 50 to 70 bushels per acre it should occupy the leading or advantageous position in the rotation because such a yield can likely be made to produce a larger amount of human food by converting it into milk and butter than the average wheat crop would.

The areas between the northern and these higher elevations on the Allegheny plateau and north and west of the southeastern section, including the following counties: Franklin, Cumberland, Fulton, Bedford, Perry, Huntingdon, Mifflin, Juniata, Snyder, Union, Montour, Northumberland, Columbia, Lycoming, Clinton, Center and Blair. Wherever the soils are derived from the limestone, the shaly limestone, the shaly Hudson River exposures, the limy Clinton shales, the Salina limy shale, the lower Helderberg limestone, the limy Marcellus, with a few areas of the Chemungs, are agriculturally among the best combined corn and wheat growing soils anywhere in the State. The agricultural soils derived from the sandy strata of the Hudson River, the Clinton, the Chemung and the Catskill formations are among the late fall or warm early spring farming soils, many of which can be plowed wet without injury and prepared early and planted with crops which will ripen during the early summer so that here late fall sown, early summer ripening crops can be raised, followed with a dry weather soil improving crop to be followed again in the fall with an early summer ripening crop so that in these poorer soils rotations can be arranged that soil improving crops can be made to follow or be raised with soil exhausting crops.

If, therefore, in these poorer soils a combination of soil improving and soil exhausting crops such as have previously been enumerated and adapted to dry and wet soils, hot, warm and cool climatic conditions can be put into rotations so that it will accomplish what all rotations should, namely, produce the largest quantity of human food while at the same time the productive capacity of the soil is increased, then certainly in the more fertile areas in all sections of the State these soil improving and soil exhausting crops can be combined that so far as crops can improve soils, which according to my opinion are the greatest factors in soil improvement, a great step will have been taken toward a permanent agriculture in Pennsylvania.

REPORT ON INSECTICIDES

By J. D. HERR, *Lancaster, Pa.*

The term insecticides is used to designate that class of substances which are known to react fatally upon insects. Of these substances, standard works upon the subject treat upwards of 150 separate chemical compounds and many times this number of formulae, not including secret or proprietary preparations, as being useful in combating injurious insects. There are no doubt others still which would also be effective for this purpose, but the expense of using them on any large scale would be prohibitive. A very small fraction of these substances will be embraced in this report for the reason that my time does not permit of even a brief mention of the relative merits of a large number, neither is this necessary, for, as a matter of fact, only a few are available for use in a commercial way, for, any chemical substance to be utilized in the struggle against parasitic insects ought to respond to the following different requirements: (1) To destroy the parasite or arrest their evolution in the least possible time. (2) To poison the parasite without at the same time injuring the host plant and to preserve its properties for some time. (3) To be cheap so that their use on a large scale will be economical and profitable.

Of the substances available there are less than a dozen possessing these qualities, but by the use of these man is fairly well armed in his combat with insects for the possession of the fruits of the earth. Of these substances the following nine in number are used in 98 per cent. of the operations directed against insects: (1) Paris green; (2) Arsenate of lead; (3) Bordeaux-arsenates; (4) Lime-sulphur solution; (5) Soap; (6) Emulsified oils; (7) Tobacco; (8) Hydrocyanic acid gas; (9) Carbon bisulfide gas. It is but the truth to state in this connection that there still are a number of insect pests which the combined wisdom and ingenuity of the most learned entomologists and chemists have as yet been unable to control.

HOW INSECTICIDES ACT

Insects are destroyed either by means of internal poisons applied to the parts on which they feed so that the poison is ingested with their food, or by materials which kill by their action on the external surface of the insect. The nature and habits of each insect therefore determine the agent to be used in controlling it. Mandibulate or biting insects are combated by the use of stomach poisons while haustate or sucking insects are destroyed by caustic or gaseous substances.

PARIS GREEN

Pure Paris green is composed of copper oxide, acetic acide and arsenious oxid, chemically combined as aceto-arsenite. Commercial grades often contain many impurities, but the National Insecticide

law of 1910 as well as our own State law, stipulates that Paris green must contain, as its active agent, at least 50 per cent. of arsenious oxid of which not more than $3\frac{1}{2}$ per cent. is in water soluble form. As early as 1872 Paris green was used against caterpillars and in 1878 it was first applied on apple trees against the codling moth. Soon after this date it became recognized as the most efficient treatment for phytophagous insects.

In 1896 over 2000 tons of this material were consumed in the United States, by far the greater portion of which was used on potatoes to kill the Colorado potato beetle. It is still largely used in the potato field applied in the dry state either pure or with a dilutent, by means of bellows early in the morning while the foliage is wet with dew. It does not, however, lend itself so well to use with liquids as it settles to the bottom of the spray tank and violent agitation is necessary to keep it in suspension so as to insure an even application. Moreover it does not stick very well to the foliage, being easily washed off by the rain so that repeated applications may be necessary to get the desired results. The high percentage of soluble arsenic in its composition makes it liable to injure the foliage especially when added to solutions containing copper, soap, or ferric chloride. For these reasons its use on fruit trees has been replaced by the safer and more adhesive arsenate of lead, and even on vegetables and field crops, arsenate of lead seems to be preferred by the grower.

ARSENATE OF LEAD

It is only in recent years that arsenate of lead has come into use as an insecticide. In 1893 Mr. F. C. Moulton, while working for the Gypsy Moth Commission of Massachusetts, first suggested its use in the extermination of the gypsy moth to replace Paris green, which could not be applied at sufficient strength to kill these caterpillars without seriously injuring the foliage. It was found that lead arsenate was entirely satisfactory and it has been the standard arsenical insecticide since that time. It possesses important advantages over Paris green, of which are the following: (1) It is not so injurious to the foliage on account of its being less soluble. (2) When sprayed upon leaves and fruits, it forms a thin film which is quite adhesive, often remaining on the plant throughout the entire growing season. (3) It remains in suspension better, requiring less agitation to insure even and uniform application. (4) It can be mixed with copper and lime-sulphur solutions without injury to foliage. (5) It forms a white, visible coating where it has been applied.

Chemically, lead arsenate may be either triplumbic or plumbic hydrogen arsenate. The triplumbic arsenate of lead is prepared by combining normal sodium arsenate with either lead acetate or lead nitrate. If any disodium arsenate is present there is then formed some plumbic hydrogen arsenate. The commercial product usually consists of a mixture of these two forms, the proportion depending on the purity of the raw materials and method of manufacture employed. Arsenate of lead is usually sold in the form of a thick paste but recently the dry powdered form has been put on the market. The National Insecticide Act of 1910 stipulated that arsenate of lead paste must contain at least $12\frac{1}{2}$ per cent. of arsenic acid, of which

not more than $\frac{3}{4}$ of 1 per cent. is soluble and the water content not to exceed 50 per cent. The best grades of lead arsenate contain a somewhat higher percentage of active arsenic oxid than provided for in this law, and these pastes are usually in a finely divided physical condition so as to be readily mixed with water and remain in suspension for a considerable time. The arsenate of lead powder is double the strength in arsenic oxid as the paste so that only one-half the amount by weight of powder is necessary to use. If the powder is fine enough to remain in suspension in water, it gives practically the same results as the paste. Otherwise the paste is to be preferred.

BORDEAUX-ARSENATES

It is well known, in pest warfare, that very often at the time arsenical sprays are applied to kill insects, certain fungicides also are indicated, and for a number of years it has been the custom with the grower to combine the arsenical with Bordeaux mixture, the most widely used fungicide, thus applying two agents at one operation. The commercial houses were quick to see the advantage of putting on the market a dual purpose spray in concentrated form, accurately compounded, which was ready for use and would require no expert to mix. This has resulted in numerous brands of combined insecticides and fungicides sold under various trade names, many of them at exorbitant prices. The active constituents of all these is none other than arsenate of lead paste and Bordeaux mixture paste, the latter of which consists of copper hydrate and calcium sulphate. When manufactured under the supervision of efficient chemists these preparations are ideal for use when a double purpose spray is indicated, especially on potatoes and garden and truck crops generally.

LIME-SULPHUR SOLUTION

The lime-sulphur-salt, or so called California wash, was originally developed as a dip for the control of scab on sheep. It was first used as an insecticide on fruit trees in 1886 at Fresno, California. In the east the first orchard trees were sprayed with lime-sulphur-salt solution in 1894 with negative results, and it was not until the year 1900 when Prof. Marlett, of the U. S. Bureau of Entomology, used it under favorable weather conditions and secured excellent results. Since that time the use of lime-sulphur washes under various formulae, with and without the salt as an ingredient has spread over the entire United States until now in point of tonnage it exceeds all other insecticides combined. It is recognized as a specific against all scale insects with the exception of the Lecanium scales and is perfectly harmless to trees of all classes during the dormant state. Just as the salt which was originally added to this mixture was eliminated because it lacked insecticidal virtue, so also the excess of lime in the original formulae was reduced to more nearly the quantity which would combine with the sulphur in the boiling process in order to reduce the amount of sediment or sludge in the finished product until at the present time the demand among consumers is for a strictly clear filtered solution which will run readily through

the nozzle of the spray pump without clogging and more intimately coat the infested surface of the trees. While the services of a trained chemist are not required to mix and boil say 100 pounds of sulphur with 50 pounds of lime in 50 gallons of water, it seems the majority of growers prefer to purchase the concentrated lime-sulphur solution from the commercial manufacturers who are prepared to secure a uniform strength which may be diluted with a given proportion of water at the time of spraying.

The chemical re-action taking place in the manufacture of lime-sulphur is really an intricate matter, and the object of the manufacturer is to obtain polysulphides-tetra sulphide and pent-asulphide of calcium—and thiosulphate of calcium, in the highest possible per cent, as these are the only ingredients in lime-sulphur having any insecticidal value. These can be determined only by means of a chemical analysis and are not always indicated by the hydrometer test. There are on the market many brands of concentrated lime-sulphur solution, analyzing anywhere from 27 per cent. to 33 per cent. calcium poly-sulphides and 1 per cent. to 3 per cent. calcium thiosulphate.

SOAP

Soap solutions are useful insecticides for killing plant lice and other small, soft bodied insects. The so-called whale oil or fish oil soaps are usually recommended for this use. Many of the commercial brands on the market contain impurities as they are usually by-products from the manufacture of other materials, and so are very likely to injure young tender foliage. An excellent fish oil soap can be made after the following formula:

Caustic soda,	6 pounds.
Water,	$\frac{1}{2}$ gallon.
Fish oil,	22 pounds.

Dissolve the caustic in the water, add the fish oil and stir briskly for 15 or 20 minutes. Soaps are useful not only for their direct effects upon insects but also by increasing the efficiency of other sprays. Three to five pounds added to 100 gallons of arsenate of lead spray liquid, will tend to prevent settling and the same amount added to nicotine solution will increase its sticking and spreading qualities.

EMULSIFIED OILS

Emulsions are oily sprays in which the minute globules of the oil used are suspended in water, a condition brought about by the addition of soap. Kerosene emulsion is one of the oldest of our contract insecticides. The action of these oils when applied on the insect is to cover them with a hermetically sealed film which produces suffocation. To this action the soap in the emulsion also contributes. The usual formula for making kerosene emulsion is soap $\frac{1}{2}$ pound, dissolved in one gallon of hot water into which is stirred two gallons of kerosene. This stock solution contains about 66 $\frac{2}{3}$ per cent. kerosene. Using this as a basis any per cent. strength of oil desired in the spray, may be applied. Commercial miscible oils are made

of petroleum oils in much the same way as kerosene emulsions, except that phenols are added and vegetable and animal oils are used with potassium or sodium hydroxide as an emulsifier.

There are now on the market a number of these miscible or soluble oils used against all scale insects and the eggs of many insects present on the trees during the dormant state. For the lecanium scales they are the only specific. The best of these oils are effective when diluted with water in the proportion of one part to from 15 to 19 parts of water. Applications should not be made when the temperature is below freezing nor while the trees are wet with snow or rain. Trees are less susceptible to injury just before the buds start in the spring.

TOBACCO

The principal alkaloid in the tobacco plant is nicotine, which is a violent poison to most insects and their larvae, and because of this it is one of our most useful insecticides. Pure nicotine is a colorless oily fluid, slightly heavier than water, of little smell, but of an extremely acrid burning taste, even when largely diluted. It is perfectly soluble in water and is entirely volatile. Commercial tobacco preparations have been on the market for some years and contain the active agent nicotine in the form of nicotine sulphate which is non volatile. The most widely used nicotine preparation is "Black Leaf 40" and this is the standard of strength which the manufacturers of other preparations have followed, containing 40 per cent. nicotine which is equal to 51.8 per cent. nicotine sulphate. Nicotine solutions may be used alone or in conjunction with miscible oils, lime-sulphate lead arsenate, soap and Bordeaux mixture.

FUMIGATION

Hydrocyanic Acid Gas. The fumes of hydrocyanic acid gas are destructive of all animal life. This gas may be used to destroy insects wherever the parts to be treated can be enclosed in an air tight chamber. For generating the gas, use of cyanide of potash (98 to 100 per cent. pure) 1 oz., Sulphuric acid $1\frac{1}{2}$ fluid ounces, water 3 fluid ounces for each 100 cubic feet of space. Pour the water in a wooden or earthen vessel, add the sulphuric acid and lastly put in the cyanide and leave the room immediately.

Carbon Bisulphide. This is a colorless liquid having a pleasant odor when pure, but is almost always fetid because of the impurities commercial grades contain. It is very volatile and vaporizes at ordinary temperatures quite rapidly. When mixed with air it is explosive and should therefore be kept away from fire. It is very efficacious as an insecticide especially for use in treating stored grains or any infested substances packed in tight receptacles and insects living underground. The gas being slightly heavier than air, diffuses into all crevices and spaces below the point at which it is generated. It kills insects by asphyxiating and paralyzing them. Use one pound of the liquid to every one hundred cubic feet of space or one hundred bushels of grain in the bin and $\frac{1}{2}$ lb. per square yard injected into the soil.

PROCEEDINGS OF THE PENNSYLVANIA BREEDERS' ASSOCIATION AND DAIRY UNION HELD IN BOARD OF TRADE BUILDING, HARRISBURG, PA., JANUARY 26-28, 1915.

PASTURES

PROF. E. D. GARDNER, *State College, Pa.*

Gentlemen: When your committee made up this program, I know they selected an important subject; but just why they selected me to talk on it, I don't know. I am sure that I would not have selected the subject for myself. I know that it is bad form for a man to assure you he knows nothing about the subject, and then try to talk about it.

This country has not developed pastures to any great extent. We find a dearth of literature on the subject, and at our Experiment Station we have done very little experimenting on pastures. The main source of reliable information is through a few farmers who have observed the results of practice.

The grazing of stock is probably the oldest agricultural practice known to man. We find reference to it in the Bible; in fact, it is stated that the son of Adam was a grazer of flocks, although his brother tilled the soil.

Coming back to modern agriculture, we find that England has been noted for her good pasture for practically a thousand years. They have given a great deal of attention to the subject, and have fine pastures, the very best land often being devoted for grazing purposes. In this part of the United States we feel that we cannot afford to devote to grass, land that is of very high value. In fact, that we must till all the land that can possibly be tilled. It is not only a question of how many dollars you can make per acre, but how many dollars you can make per man, and you can often get larger returns per man in devoting much attention to hay and pasture than you can from time spent on high priced crop.

One reason why we have paid so little attention to the growing of pasture is that we have had for many years a large tract of plains or prairie land, as free range and men could let their cattle run there, with no labor or other expense than was involved in bringing them in at the end of the year; so there was little need of developing pastures. But conditions are changed. These lands, once used for ranges, are being broken up into farms. The drier portions which were used for grazing have been over-grazed, and the grazing capacity largely reduced, so that the rearing of livestock is coming back towards the East, and there are opportunities here for developing pastures.

About 60% to 75% of the land in the East is not devoted to farm crops. What is that land doing? The forests have been cut off; there is very little merchantable forest left; the land is too hilly or

rocky to be farmed with profit. What shall be done with it? At the Experiment Station, we realize the necessity of doing something with just this kind of land, but we lack the means and the men to undertake the investigations necessary to enable us to advise what should be done. We need a special appropriation for such investigation. A large part of this land, if we just know how to do it, economically could be turned into pasture. Much of it is too steep and rocky to grow potatoes or anything of that kind, but if it could be turned into pasture on which to graze cattle it would become productive and profitable.

The amount of grass and hay produced in the United States exceeds any other crop. I do not except even corn. And the money value exceeds that of any other crop. I believe we make more profit per man on livestock than on anything else in agriculture, and livestock is dependent upon grass. You all know the old Flemish proverb: "No grass, no cattle; no cattle, no manure; no manure, no profit."

Wherever agriculture is most highly developed, livestock is most firmly established. Look at England, for instance, and how we go over there to find blooded stock, dairy and beef cattle, horses and sheep of the highest type, and even swine. Even Germany has much livestock, and so we find in all the countries where agriculture is most highly developed, there livestock is firmly established. So I believe there is opportunity for us in the northeastern part of United States, especially on those lands that are not bringing in any returns. In this country, labor is high priced and land is cheap, and it seems to me that where these conditions exist, we ought to be able to grow pasture to advantage. As I said a moment ago, it is not only a question of returns per acre, but a question of returns for the man working on that acre. Land in pasture requires little labor.

All that is required for pasture is a soil that will grow grasses and clovers. In return, these will enrich the soil. In the South, where they grow corn and cotton year after year; in many places you will find the red clay subsoil sticking out on the top of the soil, because they grow corn and cotton from year to year without growing grass. In many places in Pennsylvania, you will find the same thing. No soil can be cultivated year after year without growing grass, except by wearing out the soil. It is necessary to grow grass in order to keep your soil in condition to cultivate it profitably.

We have very little data on the return per acre of pasture or the relative food value of pasture as compared with the same when cut for hay. There are a few experiments along this line which would seem to indicate that there is a larger yield when grass is allowed to mature, but in other cases we find equally good results when used as pasture. In allowing the animals to graze, they get, first, more protein; second, grass is more digestible than hay, third, it is more palatable; and fourth, the animal gets it through its own labor, rather than through the labor of man. We find, therefore, in many cases, that it is more profitable to have grazing lands, than it is to have hay fields. Another thing we might mention right here is that when the animal keeps the grass cut for grazing, it also puts the manure right back on the soil, thus reducing the labor to a minimum. Many farmers could easily put forty or fifty acres in pasture, and cultivate the balance of their farm with the some profit and less

labor. But the question right now seems to me to resolve itself into a question of procedure. What character of lands may be economically seeded down to pastures? At Cornell, the Roberts pasture, which has been in continuous pasture for about twenty years, with a variety of grasses, is on a very steep slope, which, but for the covering of grass, would have eroded, or washed away.

Dr. Waters, when at the Missouri Experiment Station, conducted some experiments on pastures and the cost of producing beef in that part of Missouri, and he found that with steers pastured at 75c. per head per month, a gain of 1.65 lbs. per day was secured and he found that the cost on this basis was as low as \$1.60 per 100 lbs. of gain. You may think this is too low. At \$1.00, per head per month for pasture a gain of 1.85 pounds, daily was secured at a cost of only \$1.90 per 100 lbs. of gain. These prices may be exceptionally low, but they show what has been done. In the winter, he got a gain of 5.40 lbs. per bushel of corn, and in the summer, when they fed grass with the corn, they got a gain of 6.8 pounds for bushel of corn. In other words, he got a greater return per bushel of corn when the steers were on grass than he did in the winter time when fed hay.

In an experiment in Illinois, when I was there some years ago; we had two acres of blue grass in each of two plots, on each of which we kept two steers. On one lot we kept two steers on two acres of land, without any supplementary feed and they kept in good condition and made good gain. On the second two acres we kept two steers and two shoats. The steers of lot two were fed a half bushel of corn daily, and the shoats followed and picked up the corn that the steers dropped. Both steers and shoats kept in fine condition, and in the fall the shoats that followed the steers in the summer made gains at the rate of fifteen pounds of pork per bushel of corn. That gives you a little idea of the capacity of the pasture, a steer per acre, plus the shoats. An average acre of pasture is expected to produce one hundred and fifty pounds of beef yearly.

I wish to call you attention to some experiments in Virginia conducted by Prof. Carrier, and described in Bulletin 204 of the Virginia Experiment Station. A field of twenty acres was laid off into eight equal plots. The tests, covering three years, included, alternate and continuous grazing and heavy grazing, and harrowing and discing. On these eight plots the gain for an average of three years was 160 pounds of live weight per acre annually. For the heavy grazing it was 190 pounds and for the light grazing it was only a little over half as much. No particular benefit was derived from either discing or harrowing. Light grazing encouraged the encroachment of weeds in the pasture.

FEED SELECTION

PROF. F. S. PUTNEY, *State College, Pa.*

Gentlemen, and Members of the Breeders' Association: The topic on which we are to speak this afternoon is Feed Selection. It is a hard thing to teach an old dog new tricks. I have been talking on feed selection for the past year and a half, and it has occurred to me that I might talk of something you are not interested in. The time this afternoon, is to be equally divided between the next speaker, Prof. Thorne and myself. I will talk to you for a little while, and leave a part of the time open for questions, so that you may also get what you are interested in.

We are a poor excuse for farmers unless we make some provision for our families. Every farmer has a right to store up something for his old age, and to provide for his family as he goes along. So the farmer has a right to make some money, and one of the ways he can make it is in the matter of feed selection.

I have here a chart prepared by Prof. Noll, and it has occurred to me that I might use it, which you will notice, shows the results of a thirty years' rotation of corn, oats, wheat and hay.

AVERAGE ANNUAL VALUE PER ACRE OF CORN, WHEAT AND HAY,
GROWN IN A ROTATION FOR THIRTY YEARS.

	Digestible protein, lbs.	Energy value, therms	Farm value per acre, dollars
Corn,	200	2,124	\$28 68
Oats,	121	1,175	14 34
Wheat,	115	1,352	18 72
Hay,	133	1,221	17 18

You will notice that corn produces the largest amount of digestible protein, and gives us the largest value per acre, as well as the largest amount of energy. It is good practice to look for the largest amount of nutrients per acre in the selection of our feeds that we raise on the farm.

Now, one of the points to bear in mind is that there is no energy in the cow herself. She is simply a machine that makes energy from one feed or another. Proper feeding comes from the proper selection of your crops. This means that the farmer should grow the crop that will give him the most energy, and the best value.

The following table from Bulletin 114, of the Pennsylvania Experiment Station, shows us what becomes of the feed eaten, and the

result when the cow is fed too much, and also when she is fed too little.

WHAT BECOMES OF FEED EATEN.	
WHEN FED TOO MUCH	
Maintenance.	Production.
1000 lb. cow.	20 lbs. 4% milk.
WHEN FED JUST ENOUGH	
1000 lb. cow.	20 lbs. 4% milk.
WHEN FED TOO LITTLE.	
1000 lb. cow.	10. lbs. 4% milk.

The first section of this shows what happens when she is fed too much; the middle diagram when she is fed just enough, and the lower one, when she is fed too little. The animal takes care of herself first; that is natural; and when she is not fed enough to take care of herself and produce milk, her production goes down. Self-preservation is the first law of nature, and motherhood is often a stronger motive. A cow produces milk because she expects to take care of her calf and raise it. After she has fed the calf, if fed sufficiently, she will put on fat against the time when she may need it. It is the same with us. Nature provides for all animals in the same way.

Now, what can we feed the animal to provide for her, and to provide for production, and in case of young, to provide for them? First, something succulent. We know that when we put that cow out on grass, she will increase in production if she is a milk animal, or in fat, if she is a flesh animal. Then in winter we can feed silage, from twenty-five to forty-five pounds, carrots, turnips, rutabagas and beets. Silage can be raised cheaply. Roots are rather expensive. Potatoes affect the butter fat, and other things have various other effects. Dried beet pulp is good. They can be moistened, so as to be palatable to the animal and make a fair substitute for a succulent feed.

This chart shows the relative value of the different feeds in the matter of producing protein or energy.

COST OF PROTEIN AND ENERGY PER WEIGHT.

	Price per ton	Net pro., lbs.	Cost in 100 lbs. pro.	Net en. & pro. 100	Cost 100 therms of energy
Corn stover,	\$2 50	1.80	\$6 94	26.53	\$ 47
Silage,	3 50	.83	19 88	16.56	1 06
Clover hay,	14 00	5.41	12 94	34.74	2 01
Mixed hay,	18 00	3.73	21.44	34.15	2 34
Corn,	20 00	6.79	14 70	88.84	1 12
Ajax,	30 00	21.93	6 85	79.20	1 89
Cotton-seed meal,	32 00	35.15	4 55	84.20	1 90
Gluten feed,	28 00	19.75	7 02	79.32	1 76
Oil meal,	36 00	27.54	6 53	78.92	2 28
Bran,	24 00	10.21	11 75	48.23	2 48

You will notice that corn stover is one of the best feeds, and a cheap source of energy. Three to four pounds per day of corn stover is sufficient. Then comes clover and alfalfa; these are ideal, and every farmer should have one or the other. If you feed silage from twenty-five to thirty pounds, as I have suggested, corn stover from three to four pounds, corn from three to four pounds, and top off with hay, from four to seven pounds, you will have an excellent mixture. If it is timothy hay that our cows are called upon to eat, about five pounds will be sufficient; if it is alfalfa hay, it would be about seven pounds. Clover hay, it would be about six pounds. It is like with us; if their feed is palatable, they will eat more of it. These grain mixtures are usually selected with different purposes in view; first, to produce the cheapest form of energy; the second, to produce the cheapest form of protein; the third is variety, and the fourth palatability. In a general way, we must say that the four grains produce the best results, because the cow likes the variety and will give the best returns.

The prices on this chart are not necessarily correct for the present time. Prices are probably higher today than they were when this chart was prepared, but you can easily figure out the ratio for yourselves. It is not primarily the cost of a ton but it is the cost of 100 pounds of protein and 100 therms of net energy which determine the true cost of a feed.

You will note by this chart that the cheapest form of protein is in cotton-seed meal; and the cheapest form of energy is in the corn stover, but out here you will find that the very cheapest is corn at \$1.12. Corn and corn stover are the cheapest forms of energy at these prices. The second one on the list is silage. The three forms of corn are the cheapest source of energy.

Now, then, what shall we have for bulk? Here we have bran at \$24, and Ajax at \$30. Wheat bran seems to have more feeding ratio than the protein and energy given on the chart would indicate. Then we must look over the chart to see what we need for variety. There is gluten, which furnishes protein cheaply, but energy at a higher price. It is necessary to keep the cows' bowels in proper shape, and for that purpose, both these feeds work every well.

Most of you are familiar with Bulletin No. 114, of the Experiment Station, on the "Computation of Daily Rations," which covers this subject thoroughly. What I am saying this morning is more in the form of a few points for you to carry home and think over.

In the winter time, when you want the best results, you will have to feed some succulent food, some roughage, for bulk, and some concentrates. Coming down here on the train this morning, I heard two farmers discussing the question of feed. I heard one of them say that when he fed silage, he never fed corn in his grain. Now, the chances are that that man is making a mistake, because corn is probably his cheapest source of energy. Largely because his corn in the silage is no reason why he should not have some in his grain. It is estimated that three pounds of silage equals in value one pound of hay; in feeding the ordinary cow six pounds of clover hay, and thirty pounds of silage, is equal to fifteen pounds of clover hay. In addition, a succulent food produces an additional flow of milk. It is worth while to study the value of the different feeds in composition as well as in dollars and cents. During Farmers' Week, so many men spoke

AVERAGE PERCENTAGE OF CRUDE PROTEIN IN THE DIFFERENT FEEDING STUFFS.

	Minimum	Maximum
Roots and tubers,	1	3
Pasture grains,	1	4
Milk and milk products,	1	4
Straws,	3	5
Silage,	1	6
Stovers and fodders,	2	6
Leguminous pastures,	2	6
Cereal grains,	7	12
Non-leguminous hay,	5	16
Mill products,	7	18
Leguminous hay,	10	18
Oil-bearing seeds,	16	23
Mill by-products,	2	34
Leguminous seeds,	20	34
Oil by-products,	16	48
Packinghouse by-products,	21	84

On an average you will find that a feed rich in one ingredient will be poor in all the others. It is the same with men. We cannot hold more than just so much. If rich in one thing, we will be deficient in the others. Therefore it stands to reason that if the feeds we grow are deficient in protein, we must buy it. This chart shows that those products that are high in water are low in the other elements.

Here on chart No. 8, you will see the average amount of nitrogen free extract in the feeding stuffs.

AVERAGE PER CENT. OF NITROGEN FREE EXTRACT IN THE DIFFERENT CLASSES OF FEEDING STUFFS.

	Minimum	Maximum
Milk and milk by-products,	4	5
Packing house by-products, .....	..	7
Leguminous pastures,	5	14
Pasture grasses,	7	29
Oil-bearing seeds,	21	25
Silage,	7	26
Roots and tubers,	5	30
Stovers and fodders,	20	37
Oil by-products,	14	39
Leguminous hays,	30	44
Straws,	34	47
Non-leguminous hays,	25	55
Leguminous seeds,	28	55
Mill by-products,	35	67
Cereal grains,	59	75
Mill products,	67	78

Wherever we get a great many cell walls, we are getting a great deal of fibre. Think that over, and you will see that I am right.

Now, I notice the time is going fast, and I will simply call your attention to this last chart, in order that we may have time for discussion.

CHART NO. 10

MINERAL MATTER IN 1,000 LBS. OF REPRESENTATIVE FEEDING STUFFS.

Name of feed.	Total ash, lbs.	Potash, lbs.	Soda, lbs.	Lime, lbs.	Phos. acid, lbs.
Corn,	15.0	5.7	0.2	0.3	7.1
Wheat (winter),	18.0	3.7	0.4	0.6	5.5
Oats,	32.0	4.8	0.5	1.2	7.8
Barley,	25.0	4.3	0.6	0.7	7.0
Wheat bran,	58.0	15.2	0.4	1.7	26.0
Linseed meal O. P.,	55.0	13.7	0.3	4.6	6.83
Cotton-seed meal,	66.0	15.8	....	....	5.43
Pea meal,	26.0	9.9	0.3	1.3	0.24
Dried brewers' grains,	37.0	2.0	0.2	5.2	12.27
Malt sprouts,	61.0	19.9	1.1	1.7	13.46
Corn stover,	34.0	10.9	6.5	4.3	9.10
Timothy hay,	44.0	14.2	0.8	3.5	14.15
Red clover hay,	62.0	18.7	1.2	21.6	1.07
Alfalfa hay,	106.0	17.9	1.9	43.1	10.11
Cow pea hay,	142.2	14.7	2.5	12.7	....
Wheat straw,	42.0	6.3	0.6	2.4	23.35
Oat straw,	51.0	17.7	1.7	3.6	23.81
Corn silage,	21.0	3.7	1.0	2.8	....
Mangels,	11.0	3.8	0.4	1.8	0.22
Butagagas,	12.0	4.9	0.7	1.4	0.13

Most farmers claim that wheat bran at any price is the cheapest feed. But you will notice that we have here quite a number of feeds, and that corn is cheaper than wheat bran. Another man will say that dried brewers' grains is the best feed; and another red clover hay; but look at the alfalfa hay and at the cow pea hay. In one experiment wax cotton seed meal was fed for the effect on the butter until the cows got the ricketts and they had to stop it and put in some ash. These are all things that should be considered in our feed selection, particularly where the cows do not get out to pasture, as is the case at State College. We have some cows there that have not been out in pasture for nine years, and yet we have kept them healthy.

PRINCIPLES AND PRACTICE OF PLANT BREEDING

By PROF. C. E. MYERS, *State College, Pa.*

(This address was delivered with lantern slides.)

Every organism is the result of two forces, environment and heredity. By environment is meant that which has to do with immediate surrounding of the individual as soil, air and water, and by heredity is meant those factors which determine the specific nature of the individual in question.

Each of the factors mentioned are of primary importance to the complete development of every individual. They are interdependent, and the highest degree of perfection is seldom reached unless they work in harmony.

In the past most of our efforts have been directed to the improvement of plants and animals by changing and improving their environment, and the work has not been done without a considerable degree of success. However, improvements which arise because of superior environment are of short duration, and are usually accompanied by considerable expense, while improvements due to heredity, though possibly expensive, are usually more or less permanent. Thus we may increase the yield of our corn or wheat crop several bushels per acre by the application of a fertilizer rich in available plant food but the result will be for the year only, while if the increased yield be due to a superior strain of seed which produces a larger crop because of heredity, the high yielding character will be transmitted from one crop to another through succeeding years.

It is probable that more systematic attention has been devoted to the improvement of plants since the year nineteen hundred than was done in all the previous history of the world. Doubtless the greatest impetus to the work was the rediscovery of Mendel's law of which we shall speak in more detail later. Much interest has been aroused in the subject of plant breeding through the work of Luther Burbank, until at the present time his name is a common household word. The work of Burbank has served to bring the subject before the general public. Unfortunately, however, due to the efforts of over zealous journalists, many persons have been led to consider his work as magic, or else that he was running opposition to the Creator, and that his "creations" were of economic importance to an extent scarcely within the bounds of the most fertile imagination. As a matter of fact it is nothing of the kind. Practically all of the results obtained by Burbank or others, when carefully scrutinized, are relatively simply and conform quite closely to well known principles. Much of the success of Burbank is due to the fact that he works with immense numbers. It is possible that some of you have heard of some of the beautiful varieties of lilies he has developed, but doubtless you have not heard that of half a million plants only fifty were retained for further propagation, the others being destroyed. Likewise many of the positive results in plant breeding, about which the public hears so much, have been obtained only after an immense amount of painstaking work about which the public hears nothing. The practice of reporting only one side of the story has led many persons to become interested in plant breeding, later to give up in disgust, when they found that their efforts were not crowned with immediate success.

Variation is an inherent fact of all organisms. No two individuals are exactly alike. Thus the passerby looking at a field of wheat may say that the plants are all alike, but the careful observer will find that while in most instances there is a general resemblance between the plants, yet no two are exactly alike, and at infrequent intervals a plant may be found which is distinctly different from any of its neighbors. We thus have two kinds of variation, *continuous*, that in which they occur but rarely such as would be illustrated by the dis-

inctive wheat plant. By some this last type of variation is designated as *sports* or *mutations*. The fact that variations occur makes improvement possible, however, the manner and extent to which they occur is of fundamental interest to the plant breeder, and to a large degree is dependent on the method of reproduction.

All plants are reproduced by one of two methods. In one, the *sexual method*, the plant goes through the seed stage previous to which the flower or blossom performs an important function. It is this type of reproduction which is most common in the general farm and garden crops with the exception of potatoes. In the *asexual method* of reproduction, the characters are transmitted from one individual and generation to another by parts separated from the parent plant as in the case of grafting fruit trees or in potatoes when tubers are used.

The plants which are reproduced by the sexual method are further subdivided into those which are self-fertilized and cross fertilized. In the first class the same blossom contains the essential male and female organs, and are so constructed that fertilization with foreign pollen is almost or entirely impossible as is the case of the wheat plant. In the second class the plant bears two kinds of blossoms, male and female as in the case of the squash or the respective blossoms as regards sex are born on separate plants, as may be observed with respect to asparagus. Again the plant blossoms may contain both the male and the female organs but the construction is such that fertilization with other blossoms is essential to seed development as is the case with cabbage. Wherever foreign pollen is essential to the development of seed the plant is said to be cross fertilized, of which the examples cited are typical. It will readily be appreciated that variation will be much greater in individuals which are reproduced sexually than those which are reproduced asexually. This may be illustrated by the Baldwin apple which was found as a chance seedling in Eastern Massachusetts in 1742, and which has since been propagated by budding and grafting until the number of Baldwin trees doubtless runs into the millions, yet the general Baldwin characters are present whether the tree be grown near its ancestral home or hundred of miles away. It is true that there will be some slight variation due to local environmental conditions, but in general the Baldwin characteristics predominate. Likewise in the case of plants which are self-fertilized as wheat, the variation is relatively slight, and once having selected a superior strain or plant which is superior because of heredity, no further attention need be given to maintaining its purity. On the other hand, plants which are cross fertilized as corn or cabbage produce marked variations in succeeding generations because of the mixture of other plants each of which has a different parentage.

With the foregoing facts in mind it is evident that when undertaking the improvement of any crop one of the first points to receive consideration is that of the nature by which variation arise, and the extent to which they may be utilized to secure the end desired. Obviously plants which are reproduced asexually are less variable than are those in which the sexual method is involved. Therefore, once having discovered a promising variation, it may be rapidly multi-

plied in many instances by division of the parent plant as was the case with the Baldwin apple, the Concord grape and the Seckel pear, each of which originated as a sport or mutation and were later propagated. The same may be said with respect to the Gano and the Northern Spy which was discovered as a chance seedling more than one hundred years ago. Also the Roxbury russet and Jonathan, each of which have added material to the apple industry of the country. Sometimes a branch of a tree differs materially from the general type of the parent tree and thus arises a new variety as is said to have been the case with respect to the Gano, Black Ben Davis, each of which are said to have originated as bud sports from the well known Ben Davis. Also the Red Gravenstine originated as a bud sport from the regular Gravenstine.

Plants which are self-fertilized are quite satisfactory material with which to work in the attempt to produce improved varieties or strains. By isolating and propagating the chance varieties, commonly called sports or mutations, new or improved sorts may be developed. It is this method of plant improvement which has given to the world the Fultz wheat. This variety was first discovered as a plant possessing striking peculiarities in a field of Lancaster red by Abram Fultz of Mifflin county, Pennsylvania, in 1862. The plant was saved and from these selected heads was developed the Fultz which at one time was quite popular. The same method was involved in the development of the variety Gold Coin, which was found as a sort in a field of Hybrid Mediterranean by Ira W. Green of New York, who by five years of selection and propagation increased the yield about ten percent.

In the field of the vegetable gardener considerable improvement has been made by the selection and propagation of chance sports. It is said that many of the varieties of tomatoes originated by the Livingston Seed Company were found as variations in their fields of well known varieties which were being grown for seed. Likewise the variety Enormous was found as a variation in a field of Stone by Mr. Meese of Lancaster, Ohio. Again the Earliana is the result of competition on the part of truckers living in the vicinity of Sweedsboro, New Jersey, who tried to excel each other in getting on the market with the first early fruits. At State College we have made some progress along this line of selecting for earliness and yield, at the same time taking into consideration the general character of the fruit. The result of this work with Earliana is shown in the following table. It will be seen that with respect to both earliness and productiveness we have made considerable improvement when compared with the commercial seed used as a check, and which, in this case, was the best obtainable as was shown by our previous strain tests.

TABLE 1.
AVERAGE TEST OF EARLIANA

Record Number.	Average weight of fruit.	Yield per acre to Sept. 2.	Yield per acre to Sept. 12.	Corrected yield per acre.	Per cent. market-able.
	lb.	T.	T.	T.	
Check ², .....	.28	9.73	11.04	11.43	83
Check, .....	.18	9.03	13.03	15.75	83
1-3, .....	.25	12.09 ²	13.49	14.55	88
1-12 ², .....	.21	11.17	13.71	14.37	93
1-12-12, .....	.16	9.02	13.32	15.23	90
3-, .....	.22 ³	12.94 ²	15.03	16.75	87
3-18, .....	.20 ²	11.75	15.48	16.21	91
3-18-26, .....	.17	7.83	12.63	16.87	95
3-, .....	.20	7.37	11.66	15.25	95
4-, .....	.27 ²	12.65	11.99	12.93	86
4-15, .....	.21 ³	9.63	11.72	14.40	92
4-15-7, .....	.20	8.78	12.24	14.60	96
40a-, .....	.24 ³	8.91 ²	9.92	11.89	85
40a-15, .....	.22 ²	9.22	12.11	14.21	89
40a-15-4, .....	.19	7.68	11.88	13.65	97

The Department of Agronomy has been conducting some experiments with wheat with respect to selection to improve the strain as may be seen by the next table.

TABLE 2.
COMPARISON OF PARENT VARIETIES OF WHEAT WITH BEST SELECTION.

	Av. Yield 1913-14.
Reliable,	33.1 Bu.
Reliable selection 19-09 h,	37.6 "
Reliable selection 38-09,	38.8 "
Dawson's Golden Chaff,	37.1 "
D. G. C. selection 25-08,	44.0 "
D. G. C. selection 120-09,	45.5 "
Fulcaster,	30.1 "
Fulcaster selection 44-09,	40.2 "
Fulcaster selection 50-09,	36.5 "
Fulcaster selection 63-09,	35.8 "

From the above table it will be seen that the selection of Fulcaster has given an increase over the parent of nineteen percent., while the other selections have yielded slightly less.

Potatoes are a desirable crop with which to engage in plant improvement. The method usually employed is generally known as Tuber Unit. In it the tubers are cut in four pieces as nearly uniform as possible and planted one piece to a hill, each four hills being designated as a unit. At harvesting time the yield of the respective four hills are thrown together and the result compared with that of other units. In an experiment of this kind now in progress of the Department of Agronomy, there has been an average increase of 45 per cent. for the best five selections grown the past season, as may be seen from the following table:

TABLE 3.

GAIN FROM TUBER SELECTIONS OF POTATOES. TWENTY SELECTIONS FROM TWO HUNDRED SEVENTY-FOUR SELECTED TUBERS IN 1912.

	1913 Ten hill plats.	1914 Rows sixty-two feet.
Yield of parent variety,	10.3 lbs.	91.8 Bu. per A.
Av. yield of selections,	14.5 lbs.	118.7 Bu. per A.
Average gain,	42.0 %	27.0 %
Highest gain,	103.4 %	47.4 %
Av. gain of the best five in 1914,	60.2 %	44.3 %

Plants which are cross fertilized are usually quite difficult material with which to work. From the fact that two individuals are concerned in fertilization and seed formation, and that the same has been the case indefinitely, it is easy to see that the individual plant is really a collection of the characteristics of many plants to a greater or less degree. The difficulty of controlling pollination is not a small one, and this having been accomplished frequently with pollen of the kind desired, and in case fertilization does take place the plant may or may not show the desired combinations. It is true that in some cases of cross breeding, we get a blending of the characters of the respective parents, while in others only one parent shows its influence on the progeny.

It was not until 1900 that anything definite was generally known concerning the method by which certain characters are inherited. At that time the work of Gregor Mendel, an Agustinian monk, was rediscovered. He did his work with peas and reported it to a society in 1865, but it attracted little or no attention at the time and was almost forgotten until 1900 when it was rediscovered. Mendel, as a result of his careful work, which extended over a period of eight years, show how peas possessing certain distinct characteristics when crossed will produce in their progeny certain characters with mathematical accuracy. His work has done much to place the science of breeding on a firm basis, as well as to stimulate interest in the subject so that today we have Mendelian characters and ratios for both the animal and every gradation from snails and mice to man, including both the animal and the vegetable kingdoms. The work is fascinating and its results will ultimately be of inestimable value since to a large extent it makes possible the conducting of breeding work with a considerable degree of mathematical certainty.

Another fertile field of plant breeding is that of breeding for disease resistance. For example, it is estimated that the leaf blight of the potato diminishes the value of the crop more than \$36,000,000 annually. Associated with this is the indirect expense due to preventive measures as for machines, fungicides and labor. Again it not infrequently happens that the disease reaches proportions such that it becomes necessary to abandon the industry as was the case with respect to the rust on asparagus. It was introduced into this country in 1896 and in a few years had spread from the Atlantic to the Pacific, in many localities completely destroying the industry. Sprays of various kinds were tried but without positive effect and many

growers gave up in despair. A few growers, more observant than their neighbors, noticed that sometimes a plant would be found in the infected field free from the disease. These were later isolated and through the co-operation of the Bureau of Plant Industry of the Department of Agriculture, have been used as the basis of developing resistant strains. This work has been effective to an extent almost beyond the expectations of the most optimistic.

The history of the grape industry here and abroad is rich in inspiration for the plant breeder. Early settlers attempted to introduce European varieties but almost invariably they were overcome by either the phylloxera, which attacked the roots or the mildew on the leaves. The native varieties had become immune to these parasites but they were generally undesirable from the standpoint of the horticulturist. In some way, however, these pests were introduced into France and threatened to destroy the wine growing industry because of the ready susceptibility of the European varieties, and it was not until someone discovered the possibility of grafting the European varieties on American roots that the injury due to the phylloxera was overcome. It was also found practicable to hybridize with the resistant American varieties and thus successfully combat the downy mildew. Thus was the grape growing industry in both Europe and America first placed on a firm basis.

Within recent years the truckers of Wisconsin have suffered great loss from the attacks of a disease known as the "yellows" on their cabbage. Spraying is impracticable, but with the aid of the scientists of the Agricultural Experiment Station they have succeeded in developing an immune strain. Sometimes plants are found which are resistant to disease but are not desirable from other standpoints, but they may be used for hybridizing and their disease resistant properties transmitted to the progeny where it is sometimes possible to combine it with other desirable characters. This was done by Biffen, an English plant breeder when working on rust resistant wheat. At State College, we have in progress an experiment with cabbage in which we are attempting to produce a disease resistant strain of Danish Ballhead by combining it with a rather inferior variety but which is resistant to disease.

In conclusion, we may say that plant breeding will not have reached its fullest development until the general farmer and gardener, as well as the scientist, becomes interested in the work. In the past much of the work of economic value which has been done has been by persons other than professional scientists. Riley, the Indiana farmer, who bred the Boone county White corn, was an ordinary farmer and not a scientific experimenter, yet the one variety he developed is today being grown extensively over a dozen corn states and has added thousands and thousands of dollars to the corn crop of the world.

Much has been said and written concerning the tendency of boys and girls to leave the farm. Let them become interested in plant improvement, the boys in field and orchard crops and the girls in vegetables and flowers and the difficulty will largely be overcome. At the present time probably no field of human activity offers greater opportunity for interesting work and reward than does the field of plant breeding. The surface has scarcely been skimmed, and when pursued with intelligence and energy, success is almost sure to follow.

LIVESTOCK AND SOIL FERTILITY

BY DR. C. E. THORNE, *Ohio Experiment Station, Wooster, Ohio.*

Gentlemen: In what I said yesterday—I talked a good while—I meant to call attention to the experiment at your State College which takes rank as the earliest, most thorough and complete experiment in fertility in the world. Started thirty-three years ago, on a very comprehensive plan, it has continued from that day to this without interruption, its only object the study of the use of fertilizer, it has passed comprehension in value. That the results obtained there, in many cases, differ from those obtained elsewhere, is not at all a matter derogatory to the experiment, but, on the contrary, they are finding in this work that no two soils give exactly the same result; and they are finding, also, that it is necessary to conduct these experiments very carefully, and then compare the outline of an experiment on one type of soil, with the experiment on another type of soil.

I was very much interested this morning in a paper I heard upstairs—I was up there the early part of the morning—on the varieties of Pennsylvania soil. That paper was of the utmost value to the Pennsylvania farmer, because you have a larger variety of soils, and more different kinds of rock, and farm under different conditions of rainfall and temperature, such as exists probably nowhere else in the world and have a question of fertility and soil maintenance to work out, such as exists probably nowhere else in the world.

Lime—There was a good deal said about it in the past. These experiments at your State College were conducted upon a limestone soil, as it was at that day. The experiments were conducted at a time when the whole work of field experiments was still in its infancy, and they had to go it blindly. They were in a state where it was customary to use large quantities of lime—very large quantities, as compared with what is recommended today; and their experiments were of untold value in showing the foolishness of using too much lime. Now, where they applied one ton of lime every two years in a four years rotation two tons of lime every four years—and no other fertilizer, the result was that this large application of lime on a limestone soil brought about a decrease rather than an increase. Just that same thing would be likely to happen to an ordinary farmer, and he would not know why his crops were falling off. On the other hand, where two tons of ground, raw limestone have been used alternately with six tons of barnyard manure, there has been a marked increase over the use of the manure alone. One thing that was learned as the result of that experiment is that it is necessary to use lime in connection with other fertilizer. Lime cannot be used alone if we wish to keep up the fertility of our farms.

You cannot be proud enough of this work, supplemented, as it is, by other similar work in your State.

Unless I limit myself by a manuscript, I am apt to talk too long, so with your permission, I will read what I have to say, at least in

part, supplementing it from time to time as I go along, with what occur to me as being of interest to the subject before us.

"When Nature is left to itself, the soil does not lose, but gains in fertility." The annual growth of vegetation falls upon the land, covering the growths of previous years, which are gradually incorporated with the soil through the processes of decay and the action of worms, ants, and other burrowing insects and animals, each year's growth adding to the total stock of available plant food a little fresh material, which has been wrested from the rocky particles in the soil by solution in water, and by the work of micro-organisms and other agencies to which we apply the term "weathering:" so that each succeeding springtime finds the soil of the wild forest or prairie a little more fertile than the one before.

It would seem that if the land were pastured, or if all its produce were fed to the livestock and the manure returned, a similar increase in fertility should take place, and many farmers practice the keeping of livestock with this end in view; but a little consideration will show that there may be losses of fertility from the stock farm closely approaching those of the farm from which all produce is sold.

The growing animal is constantly building a skeleton, which serves as a framework to support its vital organs. This skeleton is composed chiefly of two elementary substances, both obtained from the soil, namely: phosphorus and calcium, united with each other in the combination known as phosphate of lime.

Where animals are grown upon pasture, therefore, and then sent to market, there is a steady drain from the soil of these two elements. The losses of nitrogen and potassium will be relatively smaller, because there is constantly some restoration of nitrogen from the small amount of combined nitrogen annually brought down in rain, and from the much larger amount which may be secured by the nitrogen—fixing organisms in the soil, while the amount of potassium carried away is extremely small, and is usually compensated by the weathering of the large supply of this element found in most soils.

If animals are pastured for milk production instead of for growth, the draft upon the bone-building elements is still greater, as is easily understood when we watch the rapid growth of a suckling calf, and a good dairy cow will produce enough milk in a year to raise two or three calves.

It is during the winter months that the great losses in fertility occur in livestock husbandry; for then not only are the phosphorus and calcium of the feed drawn upon for skeleton-building or milk production, but unless the manure is very carefully saved there will be large losses of nitrogen and potassium also.

Thinking farmers have long realized that these losses must be considerable, and several experiment stations have studied the question. At the Ohio station we have endeavored to learn how much of the fertilizing elements contained in the feed it is possible to recover in the manure, and what the losses in this manure are under different systems of handling. When cattle were fed on cemented floors, we were able to recover in the manure three-fourths of the nitrogen and eighty to ninety per cent. of the phosphorus and potassium contained in the feed and bedding, but on earth floor, though fed under

cover, the losses during six months feeding were sufficient to have paid half the cost of cementing the floor.

When manure from fattening steers has been exposed for three months in an open yard, in piles ten inches deep, it has lost forty-four per cent. of its potassium, thirty-two per cent. of its nitrogen, and fourteen per cent. of its phosphorus; the loss of phosphorus being lighter because the element is chiefly voided in the undigested residue carried in the solid excreta, whereas the nitrogen and potassium are chiefly found in the liquid excreta. Being already in liquid condition these elements are more readily carried out by leaching than the phosphorous.

In planning the soil fertility experiments at the Ohio Experiment Station, the ordinary farm practice of twenty-five years ago was taken as the standard. At that time it was a common practice among the more careful farmers to grow the cereal crops in a more or less systematic rotation of corn, oats and wheat, followed by clover and timothy mixed, the grass crops being allowed to stand only two years by the better farmers, though many would sow the timothy a year or two and then pasture it for one or more seasons.

It was customary to stack the straw in open barnyards and feed the livestock of the farm around these straw stacks through the winter, throwing into the yard the manure from such stock as was stabled. Usually the barnyards were not cleaned out until after harvest, partly because of the rush of work to get the crops planted in the spring, and partly in order to let the cornstalks and straw become more thoroughly rotted, so as to make the manure easier to handle. There was a very prevalent opinion that the well rotted manure was most effective, and that it would waste if exposed to the sun, and many farmers, in emptying their barnyards, piled the manure in small heaps over the field, to be spread ahead of the plow. Some, however, had discovered that manure loses only water in drying, and that a top dressing of manure, after the land had been plowed of wheat, was not only particularly good for the wheat, but also for the clover and timothy following. There may have been a few farmers who practised hauling the manure directly from the stables to the field and spreading it at once, but their number was exceedingly small.

In planning these experiments, therefore, no provision was made for the use of fresh manure, but it was taken from the barnyard and applied to both corn and wheat in a five year rotation of corn, oats and wheat, one year each, followed by clover and timothy two years. The manure was plowed under for the corn crop, because of the interference of trashy manure with the cultivation, but was applied as a top dressing to wheat. Two quantities of manure were used, eight tons per acre for each crop, on one series of five plots, and four tons on each crop for another.

Alongside of these plots were others receiving different quantities and combinations of chemical fertilizers, and it soon became apparent that the fertilizers were running away from the manure, even when they carried much smaller quantities of the necessary elements of fertility. For example, Plot 18, was getting eight tons of yard manure on corn and wheat, or sixteen tons for each rotation, estimated to carry 150 pounds of nitrogen, 32 pounds of phosphorus, and 112 pounds of potassium, while plot 14, which was fertilized on

corn and wheat only, was receiving only one-fourth this quantity of nitrogen, half as much phosphorous, and two-thirds as much potassium, and yet at the end of the first five-year rotation, the total increase on Plot 14 had been greater than that on the manured plot.

This outcome was altogether contrary to our expectations, for we shared in the common opinion that the chemical elements in manure should be as effective, pound for pound, as those in fertilizers, and that manure should possess a further advantage in its physical effect upon the soil.

We therefore undertook a more thorough study of manure, by starting a series of experiments in which manure taken directly from the stable to the field and spread at once is compared with the manure which is thrown into the barnyard and allowed to lie there for several months before it goes to the field. This work has been continued for eighteen years, and the outcome has been that the manure which has gone directly from the stable to the field has produced increase greater by twenty per cent. as an average of five duplicate comparisons, than that which passed through the barnyard.

These field experiments have, therefore, fully confirmed the chemists verdict respecting the loss which manure suffers through exposure to the weather; one chemical analysis having shown a loss of fourteen per cent. of the phosphorus, with still larger losses of nitrogen and potassium during the short period when the manure was exposed.

That the losses are very much greater when the manure lies in the barnyard until August, instead of only until April, cannot be doubted. But the loss which manure suffers from exposure to the weather is only part of the loss which is experienced under the ordinary farm practice. Attention has already been called to the relatively large draft upon the soil phosphorous in the growth of young animals and the production of milk. In grain farming there is a similar loss of this element; for as the plant matures about three-fourths of its phosphorus is transferred to the grain and whether the grain is sold or is fed, this phosphorus, or a considerable part of it, is carried off the farm. The result is that a relative deficiency of phosphorus is soon shown in the soil, and if enough manure is used to make up this deficiency, there will be a considerable waste of nitrogen and potash.

For these reasons the experiments in which fresh manure and yard manure were contrasted were so planned as to show the effect of reinforcing the manure with phosphorus, by mixing it with acid phosphate, or with the crude phosphate rock from which acid phosphate is made, these materials being added at the rate of forty pounds per ton of manure, the crude rock being ground into the fine powder called floats.

THE REINFORCEMENT OF MANURE

Manure and Treatment.	Increase per acre.			Net value of increase.	
	Corn, bus.	Wheat, bus.	Hay, lbs.	Per acre.	Per ton of manure.
Yard, untreated,	19.8	9.5	890	\$23 85	\$2 98
Fresh, untreated,	24.0	10.8	1,470	30 15	3 77
Yard, and floats,	25.2	12.5	1,637	31 78	3 97
Fresh and floats,	31.5	14.7	2,396	40 93	5 11
Yard and acid phosphate,	31.4	15.3	1,904	33 67	4 83
Fresh and acid phosphate,	35.1	16.1	2,583	44 26	5 53
Average unmanured yield,	34.3	11.5	2,717	....	....

Valuation: corn, 50c per bu.; wheat, 80c per bu.; hay,\$10 per ton.

The manure is applied at the rate of eight tons per acre to corn, in a three year rotation of corn, wheat and clover, each crop being grown every season, and the table shows the outcome of eighteen years work. In computing the net value of the increase the cost of treatment is deducted, on the basis of the cost of the materials in bulk carloads, which would be about \$7.50 per ton for floats and \$11.50 for acid phosphate, or about 15 cents per ton for manure for floats and 23 cents for acid phosphate. No allowance is made for the extra labor of handing the larger crops produced by the treatment, nor for the additional value of the straw and stover.

When the experiment was begun, it was expected that the floats, while it might be slower in action at first, would eventually produce the larger effect, because a ton of floats carries about twice as much total phosphorus as a ton of acid phosphate, but this expectation has not been realized. On the contrary, the acid phosphate is gaining relatively on the floats, as shown by the comparison below of the value of the produce of a ton of manure in these experiments for the first three rotations, or nine years, compared with the value of the nine years following:

INCREASING EFFECTIVENESS OF MANURE

Manure and Treatment.	Value of increase per ton of manure.		Gain for second period.
	First period.	Second period.	
Yard, untreated,	\$2 34	\$3 70	\$1 36
Fresh, untreated,	3 17	5 07	1 90
Yard and floats,	3 70	4 35	0 65
Fresh and floats,	4 82	5 40	0 58
Yard and acid phosphate,	4 20	5 66	1 46
Fresh and acid phosphate,	5 07	5 97	0 97

The table shows that under all the treatments the manure has produced a greater effect during the second period than during the first. This has been partly due to the use of lime during the second period, but aside from this, there has been a steady increase in the effectiveness of the manure from the earlier years of the test, such season's results, as a rule, having raised the average for the entire period of the experiment.

As between the two carriers of phosphorus the superiority of the acid phosphate over the floats has been greater during the second period than during the first.

It will be observed that the untreated manure has made a greater relative gain than either of the phosphated manures, though still far behind them. This fact, and the gain of the acid phosphate over the floats, may possibly be due to an increasing demand for nitrogen in the soil. In untreated manure, nitrogen is found in considerable excess over phosphorus, and the treatment with acid phosphate has a tendency to conserve the nitrogen.

Acid phosphate is made by mixing sulphuric acid with the raw phosphate rock. When mixed with manure, and the heap begins to heat, with evolution of ammonia, there may be a decomposition of the phosphate resulting in the formation of sulphate or phosphate of ammonia.

Our experiments have shown that a ton of manure, reinforced during accumulation with phosphorus, and taken directly from the stable to the field, may produce increase in ordinary farm crops to the value of five dollars and more, over and above the cost of its treatment. It would not be fair, however, to say that the ton of manure is worth five dollars, for parallel experiments have shown that one dollar judiciously expended in chemical fertilizers may produce an increase in the same crops to the value of two dollars, and that there may be an increasing effectiveness following the use of such fertilizers very closely approximating that observed in the use of the manure. Hence we conclude that the value which should be placed upon manure in comparison with fertilizers, should be about two dollars and a half per ton, which would be approximately the value of fresh cattle manure with bedding, if we rate it nitrogen, phosphorus and potassium at the price at which they may be purchased in such fertilizing materials as tankage, acid phosphate, or steamed bonemeal and muriate of potash.

The feeding experiments of the Ohio station have shown that in feeding cattle on cemented floors we may expect to recover about sixty pounds of manure and bedding per day for one thousand pounds live weight, or about two pounds for each pound of air dry substance in the feed. This would amount to about five tons of manure for six months' feeding.

In our experiments in the use of manure, we have obtained an eighteen year average of 67 bushels of corn, 27 of wheat, and 2½ tons of clover hay from an application of eight tons of phosphated fresh manure to the corn crop, the whole amounting to nearly eight and a half tons, including the stover and straw, and the yield is steadily increasing. This is being done on land that, when left continuously unmanured, has produced by 36 bushels of corn, 11½ bushels of wheat and 2740 pounds of hay.

It would seem, therefore, to be easily possible to organize a system of farm management which would maintain a high state of productiveness for a long time without the purchase of any artificial fertilizer except some carrier of phosphorus.

Over in England they experimented for twenty years with manure, and at the end of thirty years they were still receiving benefits which they could not have received from unmanured land. Manure is much more profitable than chemical fertilizer, as they demonstrate it over there.

I might mention, also, that we have been able to find no danger to animals by the use of acid phosphate.

ADDRESS OF MR. HARTSHORNE

Gentlemen: I can probably appreciate your disappointment in not having with you the President of the Holstein-Friesian Association. You will have to listen, instead, to one of the "has-been's"; this world has too many of them; and now you are going to listen to one of them. I cannot give you the talk that Mr. Aitken could; he is a lawyer, and a polished speaker; that is the reason he could not be here. I am merely a farmer—a "cow-man," and at the Holstein meeting yesterday one man had the audacity to tell me that no one would ever have known me if it had not been for the Holstein cow. I do not resent that, because I am such a good friend of the Holstein cow, that I feel rather proud of it. The Holstein cow has permitted me to come down and talk to you today; she has permitted me to preside over the Holstein-Friesian Association. It is not ability to talk or anything else that has permitted me to come before you today; it is because the Holstein cow permitted me to get down beside her and show that she was an animal worth raising. So, if I cannot talk to you like Mr. Aitken could, I can speak a few words about the Holstein cow and about the pure bred animal. Naturally my talk will lean towards the Holstein cow, because she is my favorite.

Now, what are pure bred animals? They are animals that have been bred all through their ancestors toward a certain type; they have been bred for so long in that way that they have transmitted to a certain degree these characteristics which have been in the mind of the breeder.

I want to say something to you today which will show you the reason for having a pure bred sire, and pure bred cattle.

Now, then, if the animal has been bred for a long time toward a certain type, she will transmit those qualities to her offspring much more easily than a grade, or one not bred to a definite purpose. If we want to make a success in life we must have a definite purpose in view, and if we want to make a success of farming, we must have a definite end in view, and the man who starts breeding animals will not be successful if he does not go about it with a definite end in

view. That is the reason why I recommend a pure bred animal. She will do for him the thing he is looking for, and the thing he has planned.

There are two principal things that cattle are bred for; the one for beef, and the other for dairy purposes. Then, again, there are special interests in the dairy business; some of us want to make butter, and others to go to the market with our milk. For the butter, we have the Guernsey and the Jersey, and for producing the milk, we have the Ayrshire and the Holstein; they produce the milk which is the best balanced ration for the human family. The Holstein or Ayrshire milk is not so rich in fat, therefore it is more easily digested, and it contains more of the proteids, and therefore the human family will thrive better on their milk than on the milk of the Jersey. The Jersey paid for my first farm. We had a small Jersey cow. I had some chickens, and the skim milk came in very good for the egg production. I sold my butter and fed my skim milk to the chickens and poults. I have also owned Ayrshires and Guernseys, and while these animals have their place, and do their work, when it comes to selling milk, I made up my mind that the Holstein is the cow for me; and also, when it came to selling her, I had more demand for her in the market. And it is the Holstein cow that has helped to leave the little old back hills, and come down into the beautiful Shenango Valley—one of the richest and most fertile valleys in the State of New York. Therefore I would be ungrateful if I did not stand up for her. She has enabled me to give up riding in the little old-fashioned high covered wagon, and now I can ride in my auto and I can ride behind a good team of horses when I want to use them, and it is all because of the Holstein cow; she has enabled me to get on in the world, and I would be ungrateful if I did not stand up for her.

And what I have done every man can do if he has a little snap and push in him. Some years ago a young man caught a coon on the way to town. He didn't know what to do with it, so he decided to give it to the boy who showed the most intelligence. He asked one of the boys, "What are you, a Democrat or a Republican?" The boy said "I'm a Republican." "Why?" "Because pa and ma are Republicans." "What are you?" he asked the next boy? "I'm a Democrat." "Why are you a Democrat?" "Oh, because pa and ma are Democrats." Then he asked the third boy; and he said "Mister, I'm anything to get that coon."

Now, there is a moral in that little story. If we want to succeed at anything, we must do anything that will help us to succeed at it, if it is work night and day, or anything else, so long as it is honorable and upright. If it means get up before daylight to milk your cow, do it,—anything that will not bring disgrace upon yourself and family.

Then, again, there is another important thing. Don't be anything because pa and ma did it or said it. I know of no man who respects his father and mother more than I do, but when it comes to leaving home, no man will succeed if he does a certain thing just because pa and ma did it. A man must decide for himself, and not be afraid of good, sound, hard work. We want to use our brains with our hands—brains and brawn goes together in making success, and you don't want to depend upon brawn altogether, anymore than you do without it altogether. Drive your business; don't let it drive you.

It is the man who drives his business that makes a success of it, whether it be breeding cattle or anything else.

There is another thing that comes in breeding cattle or anything else, and that is right stock. See that you have the right stock. It is just as true of the young man starting out in business as it is of breeding cattle or anything else; you must have the right start—have the right starting point. When a young man gets down it is mighty hard to get the upward start again. It is easy enough to trip and fall down, but hard to get up again. It is the same in breeding cattle. It is easy enough to get the wrong start, but mighty hard to build up again after you have started wrong. I am thankful that I had the right start. I did not have the advantages of the young men of today; I did not go to an agricultural school, but I did read the papers, and came to see where good animals were an advantage. Don't think it is necessary to go out and look for a good record, or pay a high price, but look for a good constitution and good blood. If you don't get a good constitution, you get a wrong start.

A dairy cow is only a machine to consume the roughage on our farms, and turn it into food fit for the human family, and you want a good, strong machine to stand up under the strain for it is a tremendous strain to take this roughage and convert it into food fit for human kind. And at the present price of feed and labor you must have a good, strong machine to make it pay. This was brought home to me in the State of Iowa when I was traveling there. This State is passing rapidly from a beef state to a dairy state, and they are trying to breed dairy animals on a beef strain. The State of Iowa is also a very high-priced state, so far as the price of land is concerned, and I don't see how any young man can succeed there, taking the high-priced farms and trying to do what they are doing there now. Of course, the man who has his land can work it with these animals, but the young man just starting out must have better animals in order to keep his land.

I was told by the Dairy Commissioner that one-third of the animals pay for their keep; one-third do not pay for their keep, and the other third make a profit. So it is necessary to have better animals, and the people are beginning to realize it more and more.

I know it is getting on towards dinner time, and perhaps I had better not talk much; it is hard for people to listen when they are hungry. I could talk for a long time about the advantages of the Holstein cow; it is the thing for which I came down.

In breeding cattle we are doing something that will influence our children and our grand-children, and what I want to impress on you is that we should stop breeding only for present dollars and cents, and breed something that we can hand down to our children and their children—cattle they need not be ashamed of and we need not be ashamed to pass on. Better not hand down so many dollars. I believe that the man who has these two ends in view will succeed better than the man who has not one of them in view.

In New York State a noted herd was sold not long ago. They were of a fine strain, but it was freely said that the man who bought them would realize his mistake. They brought enormous prices, but they were inbred to such a degree that they had lost their vigor.

CO-OPERATIVE BREEDING AND TESTING

By A. M. GOODMAN, *Dairy Division, Washington, D. C.*

The first thing, to my mind, is, are we satisfied with our dairy herds? I fear that too many farmers are, and yet on all sides we hear dairymen bitterly complaining that the prices of commercial feeds are exorbitant, and that the price of milk and other dairy products are not high enough to enable a farmer to make a living. I do not deny that feed is high, nor that the price of milk is low, when considered from a standpoint of their food values, yet so long as we expend our time and our energy railing about the prices of feed and milk, we have not advanced very far from the stage where we were crying for the moon. It does not seem to me that any man is justified in finding fault with the conditions under which he is working, until he had done all in his power to help himself, nor do I believe that in going about any improvement one should center his thought on the methods that most closely approach the impossible. In other words, why should we worry about the price of feed, if we are not studying the economical use of it, and why stew about the price of milk, when we are milking many cows that do not produce enough to pay for the feed they eat.

The returns from the herd may be increased just as much through reducing the cost of production, as through the increase of the selling price. This method of getting increased returns may not be so exciting, but it is much more sure.

Undoubtedly, the first thing to be done is to give attention to better cows, and while we are working on this, to study means of more economical feeding. I am not going to try to tell you where to buy better cows, for I do not know where good cows can be bought, except for very high prices. The original source of dairy cows is not the cow dealers' yards, but the dairy herd. If we want good, productive cows, we must raise them. Breed the best cows we have to the best bulls we can get the use of, and raise the female offspring.

Before we do this, we should be very sure which are the best cows to raise from and what is the difference in value of some of the higher producing cows. The only way to know which are the best cows in the herd is to weigh and keep records of the milk and amounts of feed for each cow. That cow is best which converts most economically the largest amount of feed into milk and butterfat. Most people who have never kept records of their herds believe that they know the best and poorest cows in their herds. However, every day records of the production of herds are showing that even the best dairymen can not tell within fifteen thousand pounds how much milk a cow gives in a year, even when they milk the cow daily.

This may seem ridiculous to some of you; but think of your own cows. Did the cow that stands by the door give 8,500 or 10,000 pounds of milk last year? Did the cow at the other end of the stable give 5,500 or 7,000 pounds? Do you know that 1,500 pounds of milk at \$1.80 per cwt. is worth \$27.00. How much did it cost you to feed

these cows last year? Did it cost you twenty-five, fifty, seventy-five, or a hundred dollars each?

If a man cannot answer these questions, I fail to see how he can claim to know much about his herd.

You may say that weighing and testing is all right, but it takes a lot of extra work, but the men who are doing it will tell you that they spend no time so profitably as that devoted to weighing milk, studying rations and keeping their records.

Probably the two men with whom you do the most business are the feed dealer and the man to whom you sell the milk. You keep an account with these men, or at least, they keep an account with you. The cows handle all these goods when they convert the feed into milk. Isn't it a business proposition for you to keep a record with them; not with the herd, merely, but with each individual? If you hire three men, so you keep an account with *all* of them? No; you keep an account with *each* of them.

As already suggested, this work takes considerable time if properly carried out. This one objection is being rapidly overcome through the organization of co-operative cow-testing associations. A cow-testing association is a little organization of twenty-five or twenty-six farmers, who own together four or five hundred cows. The Association employs a young man who has had farm experience and special training in dairying—a man who can make the Babcock test, and compute rations.

This man weighs the feed and milk of all the cows in the Association, tests the milk of each individual cow for butter fat and keeps a complete record of all the feed consumed. He also watches the feed markets and studies the analysis of feeds, so that at any time he can figure out the most economical feeds to buy. The operator or tester spends one day a month with each herd, if the herd is not over thirty cows, and on departing, leaves with the farmer a complete record showing how much every cow has produced; what the product sold for, and how much it cost to feed each cow. You will agree with me that it means a good deal of monotonous work to keep all these records. That is the reason the average farmer does not do it; he considers it too much bother. By having the work done in this co-operative way, there is no bother, as the tester does all the weighing, testing and record keeping. The important thing is that the work is done. The cost of this work is found to be about \$1.50 per cow per year. You will say, "why shall I pay a man to do what I can do just as well myself?" Do you do it? Do you keep a record? Most of you do not. You hire men to milk and plow, and help with, don't you? You can do all these things. Isn't it more important to hire two men, if necessary, to keep the record, than to saw wood.

There is not time to take up the feedings that have been made through the cow-testing associations, but I wish to say before leaving the subject that up to July 1, there were seven such associations in Pennsylvania. They were located as follows:

Kennett Square,	(started 1910)
Downingtown,	(started 1911)
Canton,	(started 1913)
Milan,	(started 1913)
Knoxville,	(started 1913)
Sugargrove,	(started 1914)
Altoona,	(started 1914)

I would like to go into details regarding these associations, but our President referred to the fact that he hoped my talk would have an end, and I am just a little afraid of that cue he's holding so threateningly. I have never been where I "got the hook," although I have often heard of it; but I want to refer to the fact that at the same date (July 1), there were a hundred and sixty-three associations scattered throughout the dairy states of the country. Through these associations hundreds of men have learned that they had been keeping cows year after year that did not pay for their feed. They have learned that they have wasted many dollars in feeding some cows; that the production of their herds was many gallons of milk less than it might have been because of feeding unbalanced rations and under-feeding some cows; that many pounds of butter fat had been wasted in skim milk because their separators were not properly adjusted, or a screw had slipped; that they were paying high prices for mixed rations when they could mix their own at a lower cost.

The members of the oldest association in this country have doubled the profitable production of their herds by studying their record and following the lessons that they teach.

The cow-testing association is the most efficient, economical and workable way in which to increase the returns from the dairy herd. The cow-testing association deals chiefly with improvement through the female side of the herd. The selection of good cows is not all in the development of the herd. That the bull is half the herd is an old and well-established statement. I want to call your attention for a few moments to the difference in bulls as regards their value as sires. For example, I will take table records of two bulls of the well-known Jersey herd of the Missouri College. The first of these bulls was Missouri Rooter.

Below is given a summary of the record of his daughter and their dams.

	Dams.	Daughters.
Average milk yield,	5380	4381
Average per cent. fat,	4.35	4.95
Average butter yield,	234	216

The bull that I will compare with this one was Missouri Rooter 3rd. The record of his daughter and their dams are as follows:

	Dams.	Daughters.
Average milk yield,	4775	6005
Average per cent. fat,	4.97	4.80
Average fat yield,	238	334

This bull was developed in the herd, and as his value was not realized, he was sold before his daughters came to milking age, and no record was left as to what became of him. Every day valuable bulls are meeting with this same fate. I often have my attention called to a string of fine heifers, well made and uniform, and learn on inquiry, that they are of the same bull and also that the bull was sold because there was danger of breeding his daughters back to him. I am not here to advocate inbreeding, but when one has paid a good price to get a good bull, why sell him before his value is known? The only way to prove a bull is by a comparison of the records of the production of his daughters and their dams. When a bull shows by his offspring that he is capable of getting daughters that are better producers than their mothers, he can, without doubt, be made by means of the most marked and rapid progress in the improvement of the dairy herd. If such a bull is owned in a large herd, he will be used on fifty or sixty cows each year, and his daughters bred to other herd bulls. In the care of the small herd, the bull question is one of the big problems and many farmers are breeding their cows to anything that will get them with calf. These men could have just as good bulls as any breeders if they would co-operate a little.

There are a number of useful methods of co-operative breeding. The simplest form is for two farms to buy bulls of the same breed, but unrelated, and to exchange bulls at the end of two years, or when their daughters are old enough to breed. The same method may be extended by having two or more farmers own one bull together. The most co-operative plan, however, is what is known as the bull association. This consists of a number of farmers who own about two hundred cows and who are intent upon developing the same breed. The cows should not be too widely scattered. The association buys four bulls. The territory covered by the association is divided into four sections of breeding blocks, and one bull is stationed in each. At the end of two years the bull in block one is moved to block two, and the bull from block two is moved to block three, and so on around the association. By this means each bull may be left in service for eight years with no chance of being led back to his daughters. There can be little doubt that during this time there will be discovered one or more hills that will be of outstanding merit and which shall be kept so long as they are sure breeders.

A bull association may be financed either by the sale of stocks, or the payment of the bulls may be secured by the individual notes of the members. The advantages of such an association are,

1. Owners of small herds have the use of first class bulls.
2. The cost of same is reduced.
3. Bulls are retained until proven, and if meritorious, throughout their natural period of usefulness.
4. A community is given a name for its livestock and buyers are attracted.

Though the bull association is a well established part of the agricultural system of the Scandanavian countries, they have not been developed to any marked extent in this country. However, they are young, and like the cow-testing association, have the support of the far-sighted breeders of the State Colleges and the Dairy Division.

At the present time these associations are located as follows: Maryland, 1; Wisconsin, 1; North Dakota, 1; Vermont, 1; Minn., 1; Michigan, 10.

Now, I appreciate just as much as any of you that I have rambled over a very large subject. Are there any questions?

APHTHOUS FEVER

By C. J. MARSHALL, *State Veterinarian.*

In the Fall of 1908 there was an outbreak of the Foot-and-Mouth Disease in Pennsylvania. It originated in Michigan and was carried to various parts of Pennsylvania by cattle shipped from Buffalo. There were eight points of infection received about the same time. The infection extended over an area of one hundred miles in length and in the part of the state where animal husbandry is most extensively practised. The infection was found on one hundred farms. One thousand three hundred and twenty head of cattle, 877 swine, 52 sheep and 3 goats were diseased or exposed to the infection. They are appraised at \$57,702.49, promptly killed, buried and the premises were disinfected. The cost of disinfection averaged about \$100 per herd. All told this outbreak cost a little over \$86,000. The Federal Bureau of Animal Industry paid two-thirds of the appraised value of the livestock destroyed and the cost of disinfection. The State paid the balance. It required three months to stamp out the disease at that time. The State was then free from Aphthous Fever for a period of six years.

The recent outbreak was discovered on two farms in Lancaster county and in one cow in the Union Stockyards at Pittsburg on October 24, 1914. The infection has existed in something over 630 herds in 27 counties in Pennsylvania since that time. Infection was carried from the stockyards in Chicago through Pittsburg and Lancaster to various places in Pennsylvania in a period of less than two weeks. Five days previous to October 24th we were notified that the disease had been diagnosed in two counties in southern Michigan and two other counties in northern Indiana. In the meantime our cattle shippers, commission men and over eight hundred veterinarians had been warned that the disease had been found in this country and that all should be on the lookout for symptoms of Aphthous Fever. In many cases infected herds were located and quarantined before suspicious symptoms had been observed. Seven administration districts had been established in the infected territory with the head office at Harrisburg. Each district was in charge of an experienced agent of the federal and state government. The federal inspectors were appointed agents of the State Livestock Sanitary Board and

cards of indentification were issued to each so he could work under the State law. About one hundred and fifty trained veterinarians were employed by the federal and state governments. The work, expense and responsibility were shared about equally by each. The work of locating and exterminating the disease was made easy from the first by the mutual co-operation of commission men, dealers, railroads, herd owners, local veterinarians, and the experienced officials in charge. The first class helped greatly by furnishing free access to records of shipments and sales. In many cases the disease was recognized and reported by the owner.

This outbreak has been the worst calamity to our stock raising industry that has ever occurred in Pennsylvania or in North America. It was forced upon us with practically no warning and came in the nature of a flood, earthquake or monstrous conflagration. Something of the extent of the disease in this country will be obtained from the following table, which was submitted this date by the Bureau of Animal Industry:

STATEMENT SHOWING PROGRESS OF WORK OF ERADICATION OF FOOT-AND-MOUTH DISEASE

State	Number of counties in entire State*	Number of counties infected.	Number of herds infected.	Number of cattle infected.	Number of sheep infected.	Number of goats infected.	Number of swine infected.	Total number of animals infected.	Number Inspectors at work Jan. 1.		Progress of work in State, Jan. 15, 1915.
									Veterinarians.	Laymen.	
Connecticut,	8	2	24	538	....	....	105	643	7	2	Completed [§] . Completed.
Delaware,	3	1	12	162	....	....	49	201	3	6	Completed.
Dist. of Columbia, .....	....	....	2	28	....	....	5	28	4	6	Completed.
Illinois,	102	50	484	14,653	507	11	21,587	36,758	110	48	Progressing rapidly [†] . Near completion.
Indiana,	92	18	94	2,172	615	....	3,340	6,127	25	18	Near completion.
Iowa,	99	6	32	979	32	....	1,581	2,592	13	10	Near completion.
Kentucky,	119	9	39	817	....	....	531	1,472	22	11	Completed.
Maryland,	24	10	39	744	197	....	531	1,472	22	11	Completed.
Massachusetts,	14	9	50	1,109	9	4	3,471	4,593	17	14	Slaughter completed.
Michigan,	83	15	236	2,322	802	....	4,004	7,728	35	23	Slaughter completed.
Minnesota,	31	3	32	1,408	237	....	11	1,656	17	6	Completed.
Montana,	10	1	2	78	....	....	26	104	3	2	Slaughter completed.
New Hampshire,	21	5	25	743	6	....	212	961	10	....	Completed.
New Jersey,	21	11	85	3,570	60	2	267	3,899	35	51	Completed.
New York,	61	11	169	3,204	2,632	1	4,254	10,111	33	20	Nearly completed.
Ohio,	88	31	654	11,059	2,269	3	6,565	17,896	60	31	Nearly completed.
Pennsylvania,	67	25	654	11,059	2,269	3	135	857	6	16	2 counties completed.
Rhode Island,	5	3	36	721	1	....	15	34	3	....	Completed.
Virginia,	100	1	1	19	....	....	....	102	3	....	Completed.
Washington,	38	1	1	102	....	....	....	102	3	....	Completed.
Wisconsin,	71	10	31	1,255	1,764	1	1,269	4,289	21	10	Slaughter completed.

*Number of counties in each state given in order to show approximate area of State involved.

†This means all herds slaughtered and disinfection completed. House-to-house canvass still going on.

§About 40% of all infection in the United States was in this State. Increasing number of inspectors available are rapidly clearing up the work. Less than 20 herds alive at last report.

•About 6 infected herds alive.

We were fortunately prepared to meet the emergency. While the experience is fresh in our minds we should decide on measures that could be safely adopted to handle a similar emergency more efficiently, if possible, in the future. It is not safe to be unprepared for calamities of this kind. Safe and sane measures are hard to promulgate and enforce during the existence of such a plague. In times of peace we should prepare for war. The plan of extermination successfully used in the outbreaks of 1902 and 1908 was adopted in dealing with this one. As soon as the disease was reported to the Board each member favored continuing the work of extermination along the same lines that had been used six years ago. The same general plan was followed by the Bureau of Animal Industry in the twenty states in which the infection was found.

It was first necessary to locate the diseased herds. Agents were sent out at once to trace suspicious shipments. When a diseased animal was found all the cattle, hogs and sheep on the premises were placed in quarantine. In all cases the diagnosis was confirmed by the state and federal agents. Both representatives were satisfied that the diagnosis was correct. The diseased and exposed cloven-footed animals on the premises were then all appraised at their actual value and arrangements made by digging the burial trenches. In some cases the work was done by the owner of the herd, while in others contractors did it. In either case the expense was borne equally by the federal and state governments. The animals were then killed, covered with one hundred pounds of lime to each one thousand pounds of estimated animal weight and buried in a grave seven feet deep, seven feet wide, and two feet in length for each mature bovine animal. Next the stable was carefully cleaned and disinfected. The owner will not be permitted to re-stock with cloven-footed animals for sixty days from the time the premises were disinfected. In the meantime a farm to farm inspection will be made within a radius of three miles from the infected herd and each susceptible animal will be examined for any evidence of the disease. During this time the township is held in quarantine and it is necessary to obtain a permit to move hay, straw, cattle, sheep, swine or hides.

In the beginning of the outbreak a quarantine was placed upon the whole State. This precaution appeared necessary for the reason that the disease was so wide-spread. The counties into which no interstate shipments had been made between October first and twenty-fourth were released from quarantine as soon as the records of sales and shipments were traced. A few counties had received such shipments and upon examination the animals were found free from infection. These counties were promptly released from quarantine by the State, but not by the Bureau of Animal Industry. It was soon considered safe to release certain townships in counties that had considerable infection. The disease was found in twenty-seven counties. Some counties had but one or two diseased herds. The counties that received the most infection were Lebanon, Lancaster, Berks, Montgomery, York, Bucks and Chester. The farmers in these six counties keep many cattle. It is their custom to purchase feeders in the fall and finish them for beef during the winter. Their purchases are usually made at the season of the year when

this infection occurred. At no other time could the infection have been spread so extensively and rapidly.

Number counties in State infected,	27
Number of herds in the State,	627
Number of animals appraised:	
Cattle,	13,088
Sheep,	313
Swine,	6,871
Amount of appraisement,	20,272
	\$787,573.18

Aside from the expense, six hundred and twenty-seven herd owners have been tied up and prevented from carrying on the winter's work. Traffic in cattle, sheep, hogs and crops has been practically at a standstill in many parts of the State. In most cases people have met the losses and embarrassment boldly and with but one purpose and that was to get rid of the disease as soon as possible. In practically every case the main objection or criticism was that it was too long from the time a diseased herd was found till it was destroyed and the premises disinfected. In most cases people were reasonably patient in this respect. Some have wondered if a less destructive method might not be safely used for exterminating the disease. This is not to be wondered at when one considers that the death rate from the disease is so low. It is known that practically 95% of the cases will recover with no treatment except reasonably good care. In a number of cases in the recent outbreak, the effected animals had recovered before they could be destroyed. The reasons for taking such extreme measures in dealing with this disease is not due to the high death rate, but to the fact that it is easily transmitted from animal to animal and from place to place, and it does cause a depreciation in the value of the affected animals to the extent of about twenty dollars per head.

We realize that the disease is not highly fatal and that recovery will take place in a high percentage of cases without even a learned course of treatment. It is one of the most highly contagious diseases of cloven-footed animals, and while the death rate is comparatively low the losses to animal industry are considerable. The disease has gained a foothold in nearly all European countries and it is practically impossible for them to adopt our method for exterminating it. It is necessary to hold infected herds in quarantine for something over three months. A recent investigator in the Netherlands where the disease is common, has shown that it cost practically \$20 per head in each infected herd to handle the disease in quarantine. This is the best they can do after many years of experience in trying to control it by the quarantine method. Their expense is figured on the loss in milk production, loss in condition of meat producing animals, loss from work in oxen, death from the disease and extra cars given to those that are sick. It is doubtful if a hard owner in this country could afford to have Aphthous Fever in his herd for \$20 per head. This would not include the expense to the State and Federal government for enforcing the quarantine. It has already cost \$120 per head to care for the prize dairy herd at Chicago. If this method were adopted there would be constant unrest in the neighborhood of an infected herd. It would be necessary to increase the inspection force to locate new centers of infection and prevent the disease from spreading. The quarantined herds should be under constant Federal or State supervision. Neither the State nor Federal government

could be expected to remunerate the owners for losses sustained during the course of the disease. It has been demonstrated in all foreign countries that this method will not exterminate the disease. We cannot do something that they have failed to accomplish. It will take us years to develop Veterinary Sanitary Police Regulations for handling Aphthous Fever by the quarantine method that is as good as theirs. We cannot afford to even experiment with it. It would be a calamity to the cattle, swine and sheep industry of this country to have this disease get beyond our control.

Careful records were kept by Dr. Rudovsky of the average losses by this disease in Austria. In 13,858 head of cattle on 91 farms belonging to sugar factories, and 2,054 head on 802 small farms, the losses from milk decrease, oxen incapacitated for work, loss of condition in all animals, natural death and compulsory slaughter, amounted to about \$20 per head. He estimates an annual loss of over a million dollars in Austria. This is a safe estimate for the losses each year in the countries of Continental Europe. Infection comes from Russia and other Eastern countries where animal hygiene measures are practically nothing and it passes rapidly westward to sections of Europe where veterinary police regulation are most perfect. It has been practically impossible to exterminate Aphthous Fever from the herds in France, Belgium, Switzerland, Italy, Germany, Austria and Holland for the reason that fresh infections are constantly being brought in from Russia, Roumania, Turkey, Siberia, etc.

The policy followed by many foreign countries is to adopt rigid quarantine measures. No animals are killed on account of this disease unless they become worthless. For them perhaps this is the cheapest and best policy but for the people in North America, where we are surrounded by water and ice, and the infection is brought in only occasionally, it seems best to continue the plan so successfully used in all past outbreaks. The disease cannot be considered as a source of danger to man. Its principal importance is an economic question. If property must be destroyed and animals slaughtered for the public good the owners should be compensated for their entire loss, provided it can be shown that the disease was brought about by no fault of the owner.

Under the present law, our Board is limited in amount of indemnity that can be paid for animals that it is deemed necessary to destroy, to \$70 for a registered bovine, \$40 for non-registered bovine and \$10 for a sheep or hog. The United States Government will duplicate these amounts in the present outbreak, but some animals have been destroyed that are worth from twenty to forty times the amount allowed by law. Should not the law be fixed so that it would be possible to pay full value for such animals when it becomes necessary to destroy them for the benefit of the State or country? The diseases from which such extreme measures are necessary are but few. Aphthous Fever is the only one with which we have had to deal so far. Rinderpest is equally as important and there is no positive assurance that our herds may not become infected with it. The dangers from these diseases have increased wonderfully in the past few years by the progress made in the transportation.

Rapid progress has been made in destroying the infection from the present outbreak of Aphthous Fever. The payment for property and

stock destroyed has necessarily been held back. Under normal conditions the Board had money sufficient to meet its obligations up to June first, 1915, when the present appropriation was to terminate. The Board has now petitioned the Legislature for \$558,000 to reimburse the owners for losses sustained. Let us trust that the Legislature can and will make the necessary appropriation so the bills can be paid without delay.

The Bureau of Animal Industry petitioned for \$2,500,000 to pay its half of the expense in this and other states. The appropriation has been made and is now available.

In the previous outbreak of 1908, all just bills were promptly paid. For this reason it has been much easier to convince the people that they would be paid for their losses this time.

Infection during the present outbreak was carried from the original to other farms in a few cases. In nearly every place it was carried in refuse and utensils from creameries to which milk from infected herds had been sent. If the creamery refuse had been pastuerized as required by law, thousand of dollars would have been saved and much annoyance prevented.

Every state should be prepared with laws, rules, regulations, agents and money to fight Aphthous Fever, rinderpest and all other transmissible diseases of livestock. The fight should be determined and persistent. A herd owner should not be a menace to his neighbors and no state should send Aphthous Fever, hog cholera, tuberculosis, glanders, etc., to other states to jeopardize their livestock interests. This cannot be done without efficient official supervision and a strong public sentiment on the part of herd owners in favor of genuine co-operation with federal, state and local authorities.

It is hoped that you will feel that the work of exterminating the disease has been honestly and promptly done and that money will soon be available for paying all just claims.

The following order of general quarantine adopted by the State Livestock Sanitary Board, January 27th, 1915, supersedes the order of general quarantine adopted December 30th, 1914, and shall become effective February 1st, 1915.

"The fact has been determined by the State Livestock Sanitary Board and notice is hereby given that Foot-and-Mouth Disease which has been and is adjudged and proclaimed by the said Board to be of transmissible character, exists in livestock in certain sections of Pennsylvania and it is deemed advisable to release from quarantine all territory in Pennsylvania except the counties of Lancaster, Lebanon, Lehigh and York, and also the townships of Berwick, Conewago, Germany, Hamilton, Mt. Pleasant, Oxford, Reading and Union in Adams county; Franklin, Penn, Reserve, Robinson and Ross, also the Boroughs of Bellevue, McKees Rocks, Aspinwall, Avalon, Ben Avon, Ben Avon Heights, Braddock, Crafton, Edgewood, Emsworth, Etna, Green Tree, North Braddock, Rankin, Swissvale, Thornburg, Turtle Creek, Verona, Westwood, Wilkinsburg, also the 14th, 20th, 23rd, 24th, and 26th Wards, City of Pittsburg, in Allegheny county; South Beaver in Beaver county;

Albany, Alsace, Bethel, Brecknock, Caernarvon, Cumru, Greenwich, Heidelberg, Lower Heidelberg, North Heidelberg, Hereford, Jefferson, Maiden Creek, Marion, Maxatawny, Muhlenberg, Ontelau-

nee, Penn, Richmond, Robeson, Rockland, Spring, Tulpshocken, Upper Tulpshocken, Washington and Windsor in Berks county;

Bedminster, Bridgeton, Durham, East Rockhill, Haycock, Hilltown, Milford, New Britain, Nockamixon, Plumstead, Richland, Springfield, Tinicum, Warrington, West Rockhill and all territory in Buckingham and Solebury north of the Doylestown and New Hope Pike in Bucks county; East Penn and Mahoning in Carbon county; Birmingham, East Bradford, West Bradford, East Brandywine, West Brandywine, Caln, East Caln, West Caln, Elk, East Fallowfield, West Fallowfield, East Goshen, West Goshen, Highland, Honeybrook, Londonderry, London Grove, East Marlboro, West Marlboro, East Mantmeal, West Mantmeal, Newlin, East Nottingham, Lower Oxford, Upper Oxford, Penn, Pennsbury, Pocopson, Sadsbury, Thornbury, West Sadsbury, Upper Uwchlan, Valley, Wallace, Warwick, Westown, West Whiteland and Willistown in Chester county; Madison in Columbia county; Lower Allan, Monroe, Silver Spring, Southampton and Upper Allen in Cumberland county; Conewago, Derry, East Hanover, South Hanover, West Hanover, Londonderry, Lower Paxton, Swatara and Lower Swatara in Dauphin county; Aston, Bethel, Birmingham, Concord, Darby, Upper Darby, Edkmont, Haverford, Marple, Middletown, Lower Providence, Upper Providence, Springfield, Thornsburg, and Tinicum in Delaware county; Antrim, Greene, Peters, Montgomery and Southampton in Franklin county; Fairfield and Loyalsock in Lycoming county; Granville, North Derry, South Derry and West Derry in Mifflin county; Douglass, Franconia, Frederick, Upper Gwynedd, New Hanover, Upper Hanover, Hatfield, Limerick, Marlboro, Montgomery, East Norriton, West Norriton, Perkiomen, Lower Providence, Upper Providence, Salford, Lower Salford, Upper Salford, Skippack, Towamensing and Worcester in Montgomery county; Anthony, Derry, Limestone, Mahanoy and Valley in Montour county; Bethlehem, Forks, Hanover, Lower Saucon, Palmer, Washington and Williams in Northampton county; Jackson, Jordan and Lower Mahoney in Northumberland county; Center, Miller, Oliver and Wheatfield in Perry county; Branch, North Manheim, South Manheim, Pinegrove, Reilly, Tremont, Washington and Wayne in Schuylkill county; and Allegheny, Derry and Upper Burrell in Westmoreland county, including all cities and boroughs located in the aforesaid area.

Therefore, the State Livestock Sanitary Board, under authority conferred by law does hereby establish a general quarantine throughout the aforesaid area, including all cities and boroughs located within the said area, subjecting to said quarantine all cattle, sheep, other ruminants and swine, also hay, straw or similar fodder, hides and skins.

The said quarantine area is divided as follows:

(a) Closed area: All territory within a radius of three miles of an infected premises that has been disinfected for less than fifteen days.

(b) Exposed area: All territory in a township or municipality beyond the limits of a closed area, also all townships or municipalities containing infected premise that has been disinfected for less than thirty days.

(c) Modified area: All territory not included in a closed or exposed area.

IT IS HEREBY ORDERED, First: The movement of cattle, sheep, other ruminants and swine or within any closed area is absolutely prohibited, and the movement of dressed carcasses of such animals, the hides, skins, or hoofs of such animals, and all hay, straw or similar fodder may be moved only on official permit.

Second: The movement of cattle, sheep, other ruminants or swine from or within any exposed area is permitted for immediate slaughter after inspection and certification, and into which such animals may be moved for any purpose; also from which the movement of dressed carcasses of such animals, the hides, skins or hoofs of such animals, and all hay, straw, or similar fodder may be moved on official permit.

Third: The movement of cattle, sheep, other ruminants or swine from or within any modified area is permitted for immediate slaughter without inspection, and into which such animals may be moved for any purpose; also from which the movement of dressed carcasses of such animals, the hides, skins or hoofs of such animals, and all hay, straw or similar fodder is permitted without any restrictions.

Fourth: All permits must be taken out in advance and must be held by the person in charge of and accompanying the animals, and must be kept available for inspection. If shipment is made by rail, the permits must be attached to the waybill.

Fifth: When cattle, sheep, other ruminants or swine are transported within or from any exposed or modified area, clean and disinfected cars or conveyances must be used. All such cars or other conveyances must be cleaned and disinfected before being again used for any purpose.

Sixth: All receptacles, cars or conveyances used in transporting hides, skins, or hoofs from one point to another within or from any closed or exposed area must be cleaned and disinfected before being again used for any purpose.

The movement of hides, skins or hoofs in cars or other conveyances that contain other merchandise, is prohibited, unless said hides, skins or hoofs are in a covered, water-tight receptacle.

Seventh: Collecting carcasses of cattle (including calves), sheep or swine, also hides or skins of such animals at farms situated within any closed area is prohibited.

Eighth: Public sales or exhibitions of cattle, sheep, other ruminants or swine within any closed area are prohibited, and in exposed or modified may be held on official permit.

Ninth: Shipments of cattle, sheep, other ruminants or swine into Pennsylvania from sections now under Federal quarantine in the State of Illinois, including the Chicago Stockyards, for any purpose, are absolutely prohibited.

Tenth: No cattle from points outside of Pennsylvania will be permitted to enter Pennsylvania for purposes other than immediate slaughter.

Eleventh: The general quarantine proclaimed hereby supersedes the general quarantine proclaimed December 30, 1914, shall become effective February 1, 1915, shall be maintained in force until officially revoked by the State Livestock Sanitary Board, and for the purpose of identification shall be known as Form 168.

Violation of any of the foregoing orders will be prosecuted according to the Act of July 22, 1913.

(Signed,) STATE LIVESTOCK SANITARY BOARD,
By C. J. MARSHALL,
State Veterinarian."

OFFICERS OF THE PENNSYLVANIA JERSEY BREEDERS' ASSOCIATION.

President, W. C. Norton, Dalton, Pa.
Sec'y. & Treas., A. K. Heath, Paoli, Pa.

OFFICERS, OF THE PENNSYLVANIA BERKSHIRE BREEDERS' ASSOCIATION.

President, Henry Fielden, Newton Square.
Vice Presidents, George T. Van Norman, Langhorne; Dr. Vallie Hawkins, Fawn Grove.
Sec'y & Treas., D. Buckley, Broadaxe.

Board of Trade Building, Harrisburg, Pa.
Thursday, January 28, 1915.

At a meeting of the Sheep Breeders of Pennsylvania, the following organization was effected:

On motion of Mr. J. F. Lantz, properly seconded and duly carried in the regular way, Mr. R. M. Munce was elected temporary chairman.

The following gentlemen were found to be present: R. M. Munce, Canonsburg; J. F. Lantz, Harrisburg; Fremont Bowman, Philadelphia; W. G. Black, Mercer; George Stevenson, Waverly.

On motion of Mr. Lantz, properly seconded and duly carried in the regular way, Mr. Munce was elected President, and Prof. Severson of State College Secretary and Treasurer. Prof. Severson had been present, but was obliged to leave before the organization was affected.

On motion of Mr. Lantz, properly seconded and duly carried in the regular way, the President was instructed to appoint an Executive Committee, to consist of five or more members, and to include the President and Secretary. The following gentlemen were named on the Executive Committee: R. M. Carrons, Washington; George Stevenson, Waverly; E. A. Weimer, Lebanon; G. R. Herd, Genesee; Fremont Bowman, Philadelphia; Franklin Smedley, Frankford; the President R. M. Munce, and the Secretary, Prof. Severson.

The following gentlemen were nominated for membership: G. R. Herd, Genesee; W. C. Black, Mercer; Fremont Bowman, City Farms, Philadelphia; George Stevenson, Waverly; J. F. Lantz, Harrisburg; J. M. Paxton, Canonsburg; Franklin Smedly, Frankford, Philadelphia; Samuel Evans, Frankford, Philadelphia; Drs. Ray and Devlin, Oakford; A. K. Heath, Paoli; R. M. Munce, Canonsburg; E. A. Weimar, Lebanon; R. M. Carrons, Washington; Prof. Severson, State College.

After effecting this organization, the Association adjourned to meet again at the call of the President.

PENNSYLVANIA BREEDERS' ASSOCIATION.

President, E. S. Bayard, Pittsburgh.

Secretary, George E. Stevenson, Waverly,

Treasurer, J. F. Lantz, Harrisburg.

Chairman Livestock Breeders' Department, Hon. W. C. Norton, Harrisburg.

Chairman Plant Breeders' Department, Prof. C. F. Noll, State College.

STATE DAIRY UNION.

President, E. M. Bailey, Pittsburgh.

Vice President, W. R. Gorham, Muncy.

Secretary, C. W. Larson, State College.

Treasurer, W. E. Perham, Pleasant Mount.

PENNSYLVANIA STATE POULTRY SOCIETY.

President, Hon. Edgar A. Weimer, Lebanon.

First Vice President, W. Theo. Wittman, Allentown.

Second Vice President, Hon Geo. T. Weingartner, New Castle.

Secretary, J. D. Koons, Treichlers.

Treasurer, Chas. F. Rosenow, Norristown.

PENNSYLVANIA POULTRY BREEDERS' ASSOCIATION.

President, Frank McGrann, Lancaster.

Vice President Hon. Edgar A. Weimer, Lebanon.

Secretary, W. W. Deissler, Chestnut Hill.

Treasurer, Fred H. Cook, Beaver.

APPENDIX



APPENDIX

List of Publications of the Pennsylvania Department of Agriculture

ANNUAL REPORTS

- *Report of the State Board of Agriculture, 336 pages, 1877.
- *Report of the State Board of Agriculture, 625 pages, 1878.
- *Report of the State Board of Agriculture, 560 pages, 1879.
- *Report of the State Board of Agriculture, 557 pages, 1880.
- *Report of the State Board of Agriculture, 646 pages, 1881.
- *Report of the State Board of Agriculture, 645 pages, 1882.
- *Report of the State Board of Agriculture, 645 pages, 1883.
- *Report of the State Board of Agriculture, 648 pages, 1884.
- *Report of the State Board of Agriculture, 645 pages, 1885.
- *Report of the State Board of Agriculture, 646 pages, 1886.
- *Report of the State Board of Agriculture, 650 pages, 1887.
- *Report of the State Board of Agriculture, 648 pages, 1888.
- *Report of the State Board of Agriculture, 650 pages, 1889.
- *Report of the State Board of Agriculture, 594 pages, 1890.
- *Report of the State Board of Agriculture, 600 pages, 1891.
- *Report of the State Board of Agriculture, 640 pages, 1892.
- *Report of the State Board of Agriculture, 713 pages, 1893.
- *Report of the State Board of Agriculture, 646 pages, 1894.
- *Report of the Department of Agriculture, 878 pages, 1895.
- *Report of the Department of Agriculture, Part 1, 820 pages, 1896.
- *Report of the Department of Agriculture, Part 2, 444 pages, 1896.
- *Report of the Department of Agriculture, Part 1, 897 pages, 1897.
- *Report of the Department of Agriculture, Part 2, 309 pages, 1897.
- *Report of the Department of Agriculture, 894 pages, 1898.
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No. 109.* Tabulated Analyses of Commercial Fertilizers, 208 pages, 1903.
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No. 256. Creameries and Cheese Factories of Pennsylvania, 32 pages,
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No. 258. Seed Report, 1913, 36 pages, 1914.
No. 259. Commercial Fertilizers, Fall, 1914. 66 pages, 1914.
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FERTILIZER VALUATIONS, 1914

The object of an official valuation of commercial fertilizers is to enable the consumer to judge approximately whether he has been asked to pay for a given brand more than the fertilizing ingredients it contains and market conditions prevailing at the time would warrant. It is clear, therefore, that no attempt is made in this valuation to indicate whether the fertilizer valued possesses a greater or less crop-producing capacity than another fertilizer; but only whether it is higher priced than another of the same general composition.

For this purpose the valuation must be so computed as to include all the elements entering into the cost of a fertilizer as it is delivered to the consumer. These elements differ with the conditions of sale. Sales to consumers fall chiefly into two classes: (1) Those made directly from the jobber or manufacturer to the consumer, without the service of a local agent or dealer. Such sales are usually in relatively large lots for cash. (2) Those made through a local agent or dealer. These are most commonly made in relatively small lots and often with arrangements for deferred payments.

In some states, the valuations are so made as to represent sales only of the former class. In Pennsylvania, however, the principal volume of sales is of the second class, and the method of valuation has, therefore, included the additional cost elements involved in this mode of sale. The several cost elements or factors may conveniently be grouped as follows:

1. The wholesale cost of the ingredients.
2. The jobbers' gross profit on the sale of the ingredients; this includes office expenses, advertising, losses, etc.; for the purpose of the present computation it may be assumed that the sum of this gross profit and the wholesale cost of the ingredients, is equivalent to the retail price of the single ingredients near the wholesale markets in ton lots of original packages for cash.
3. The expense and profit of mixing: This item applies only to complete fertilizers, rock and potash, and ammoniated rock; not to dissolved or ground bone, or to dissolved rock.
4. The expense and profit of bagging.
5. Agents' commission: This item includes not only the commission proper, but every advance in price due to the sale of the goods through an agent in small quantities on time, rather than directly to the consumer in ton lots for cash.
6. Freight from the wholesale market to the point of delivery.

The valuations for 1914 are based:

1. Upon the wholesale prices from September 1, 1913, to March 1, 1914, of the raw materials used in fertilizer manufacture, the quotations of the New York market being adopted for all materials except acidulated phosphate rock and ground bone.
2. Upon an allowance of 20 per cent. of the wholesale prices, above mentioned, to cover jobbers' gross profit.

By adding the 20 per cent. allowed for jobbers' gross profit to the wholesale price of the several raw materials, the retail price in original packages at the jobbers' warehouse is obtained.

Since the amount of the several valuable fertilizing constituents in the various raw materials is known, it is a simple matter to determine the corresponding retail value per pound of the valuable fertilizing constituents yielded by each raw material. A schedule of these pound values affords a convenient basis of computation of the value per ton of various fertilizers, whose composition is ascertained by analysis.

The values assigned, for the present, to the other elements in the cost of the fertilizer at the point of delivery are:

- 3. For mixing, \$1.00 per ton.
- 4. For bagging, \$1.00 per ton, in all cases except those in which the article was sold in original packages; the cost of the package being, in such case, included in the wholesale price.
- 5. For agents' commission, 20 per cent. of the cost of the goods f. o. b. at the jobbers' or mixers' warehouse.
- 6. For freight, \$2.00 per ton; the cost of the freight in lots of twelve tons or over, from the seaboard to Harrisburg, averaging \$1.88 per ton.

The following valuation of dissolved South Carolina rock illustrates the method:

Phosphoric Acid.	%	Weight per ton.	
Available,	14.00	280 lbs. at 3c,	\$8.40
Insoluble,	1.00	20 lbs. at 1½c, ...	.30
Retail cash value of ingredients,			8.70
Bagging,			1.00
Cash value of goods ready for shipment,			9.70
Agents' commission, 20 per cent.,			1.94
Freight,			2.00
Commercial value per ton,			\$13.64

It is not to be expected, of course, that the valuations thus computed will precisely represent the fair price to be charged for a brand in each locality and in every transaction. Market conditions, competition, distance from factory, all introduce minor variations. Nevertheless, to make the approximation reasonably close the average valuation of a given class of goods ought to agree closely with its ascertained average selling price. Whenever such an agreement is no longer obtained by the use of a schedule, it is evident that the schedule of retail values of the constituents, or the added allowances for mixing, etc., requires revision.

It is needful to note here another factor greatly affecting the practical accuracy of these approximations. Their computation would offer little difficulty and their usefulness be far greater, if, by the ordinary methods of analysis, the exact nature of the ingredients used to supply the several fertilizer constituents, were capable of certain determination. This is, however, possible to-day to only a limited extent. The valuations are therefore based in general on the assumption that the fertilizers are uniformly compounded from high quality ingredients, such as are commonly employed in the manufac-

ture of fertilizers of the several classes. Consumers should carefully avoid the error of accepting such valuations as infallible; they are not designed to be used for close comparisons of single brands, but only to indicate whether the price asked for a fertilizer is abnormal, assuming good quality for the ingredients used. From this it is clear that, *except as high freights may require, the selling price of a brand should not far exceed the valuation; but that a fertilizer may be made of inferior materials and yet have a high valuation.*

The valuations used during 1913 have been modified for use during 1914 in accordance with the changes in wholesale prices of fertilizing ingredients and to make the valuations more closely follow the selling price.

The following comparative statement shows the valuations and selling prices of the several classes of fertilizers during 1909 to 1913.

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Spring, 1909.				
Complete,	426	\$25 31	\$24 88	— .43
Rock-and-potash,	111	15.94	16.98	—1.20
Dissolved bone,	8	21.57	22.25	— .68
Ground bone,	24	30.28	30.70	— .42
Dissolved rock,	33	13.62	14.76	—1.14
Fall, 1909.				
Complete,	255	22.25	22.07	.14
Rock-and-potash,	92	15.50	16.10	— .60
Dissolved bone,	3	22.85	24.50	—1.65
Ground bone,	26	28.71	29.39	— .68
Dissolved rock,	41	14.02	13.86	.16
Spring, 1910.				
Complete,	436	26.63	25.26	1.37
Rock-and-potash,	123	16.08	17.16	—1.08
Dissolved bone,	8	21.47	22.17	— .70
Ground bone,	24	30.27	30.19	.08
Dissolved rock,	47	14.00	14.56	— .56
Fall, 1910.				
Complete,	294	22.24	21.76	.48
Rock-and-potash,	109	16.34	16.38	— .04
Dissolved bone,	4	25.70	25.80	— .10
Ground bone,	29	31.10	29.98	1.12
Dissolved rock,	32	14.15	14.01	.14
Spring, 1911.				
Complete,	485	25.95	24.97	.98
Rock-and-potash,	129	15.99	17.05	—1.06
Dissolved bone,	6	23.82	20.33	3.49
Ground bone,	23	31.47	30.93	.54
Dissolved rock,	51	14.86	15.83	.97
Fall, 1911.				
Complete,	292	22.33	21.73	.60
Rock-and-potash,	129	16.07	16.25	— .18
Dissolved bone,	3	21.51	24.88	—3.37
Ground bone,	25	31.18	31.17	.01
Dissolved rock,	42	13.78	14.00	.22
Spring, 1912.				
Complete,	470	27.24	27.64	.40
Rock-and-potash,	137	16.26	18.27	2.01
Dissolved bone,	4	18.92	20.94	2.02
Ground bone,	24	33.26	32.81	.55
Dissolved rock,	43	14.20	14.69	.49

Fertilizers.	Number of samples.	Valuation.	Selling price.	Difference of valuation from selling price.
Fall, 1912.				
Complete,	288	23.49	22.16	1.33
Rock-and-potash,	124	16.55	15.88	.67
Dissolved bone,	4	25.50	23.80	1.70
Ground bone,	28	34.84	30.55	4.29
Dissolved rock,	42	13.92	13.80	.12
Spring, 1913.				
Complete,	531	26.44	25.08	1.36
Rock-and-potash,	140	16.52	16.75	-.23
Dissolved bone,	4	21.63	18.55	3.08
Ground bone,	32	32.50	33.86	-1.36
Dissolved rock,	43	14.25	13.96	.29
Fall, 1913				
Complete,	292	24.36	21.92	2.44
Rock-and-potash,	140	16.85	16.25	.60
Dissolved bone,	6	24.26	24.75	-.49
Ground bone,	36	32.63	31.12	1.51
Dissolved rock,	40	13.70	13.51	.19

The following statement from the weekly reports of the Oil, Paint and Drug Reporter, of New York, shows the average wholesale prices of fertilizer raw materials from September 1, 1912, to March 1, 1913, and from September 1, 1913, to March 1, 1914.

Substance.	Amount Priced.	Average price Sept. 1, 1912, to March 1, 1913.	Average price Sept. 1, 1913, to March 1, 1914.	Prices Sept.-March, 1913-1914, in per cent. of prices of 1912-1913.
Sulphate of ammonia,	Cwt.,	2.560	2.290	89.5
Nitrate of soda,	Cwt.,	2.560	2.290	89.5
Dried blood, H. G.,	Unit (20 lbs.),	2.736	3.110	113.6
Concentrated tankage,	Unit (20 lbs.),	2.40	2.76	115.0
Rough bone,	Ton,	23.25	23.25	100.0
Bone meal,	Ton,	29.25	29.25	100.0
Fish guano, dry,	Unit (20 lbs.),	3.113	3.31	106.3
Phosphate rock, Tenn.,	Ton,	5.25	5.25	100.0
Acid phosphate,	Unit (20 lbs.), .....	.525	.525	100.0
Double manure salt,	Ton,	24.95	24.97	100.1
Sulphate of potash,	Ton,	46.80	47.156	100.8
Kainit,	Ton,	8.45	8.425	99.7
Muriate of potash,	Ton,	33.55	33.356	99.5
Sulphuric acid, 66 degrees B.,	Cwt.,	1.05	1.05	100.0

In ammoniates such as dried blood and fish guano, the unit is of ammonia, of which 82.25 per cent. is nitrogen; in acid phosphate the unit is of phosphoric acid (phosphorus pentoxid).
There has been a decided rise in the prices of some of the organic ammoniates, and a decrease in the cost of nitrogen from inorganic sources.
Phosphate rock, sulphuric acid and acid phosphate show little change in prices compared with last year.

According to the *Oil, Paint and Drug Reporter*, (Vol. 85, No. 3, Jan. 19, 1914) the German syndicate has fixed the schedule of whole-sale prices (per ton of 2,000 lbs. net) for 1914 as follows:

Muriate of potash, 80 to 85 per cent.—80 per cent.,	\$39.07
Muriate of potash, min. 95 per cent.—80 per cent.,	40.75
Muriate of potash, min. 98 per cent.—80 per cent.,	41.65
Sulphate of potash, 90@95 per cent.—90 per cent.,	47.57
Sulphate of potash, min. 96 per cent.—90 per cent.,	48.14
Double manure salt, 48@ 53 per cent.—48 per cent.,	25.04
Manure salt, min. 20 per cent., actual potash in bulk,	13.58

In bags of 200 lbs. net; no charge for bags.

Hardsalt, min. 16 per cent., actual potash in bulk,	10.87
Kainit, min, 12.4 per cent., actual potash in bulk,	4.36

Potash Imports: The Bureau of Foreign and Domestic Commerce states that the potash salt imports for 1912 and 1913 were as follows:

	1912.	1913.
Muriate (lbs.),	483,744,601	450,731,995
Sulphate (lbs.),	99,626,582	95,748,145
Kainit (tons),	485,132	466,795
Manure salts (tons),	192,738	171,802

Composition of Raw Materials.—In order to form a correct idea of the cost per pound of the fertilizer constituents of these materials, it is needful to determine their composition or, in other words, the quantities of valuable constituents each contains. The following table shows the composition of raw materials used in the manufacture of fertilizers. Few analyses of these materials, with the exception of ground bone and dissolved rock, have been made in Pennsylvania. The figures in the following table include the averages of the results of analyses made in Connecticut, New Jersey and Massachusetts during the past year, except in the case of ground bone and dissolved rock phosphates, where Pennsylvania results alone are included.

Composition of Non-Acidulated Fertilizer Ingredients, (Per Cent.)

Substance.	Number of samples analyzed.	Nitrogen.	Potash.	Total phosphoric acid.
Sulphate of ammonia,	9	20.62	.....	.....
Nitrate of soda,	62	15.32	.....	.....
Dried blood,	13	10.71	.....	.....
Ground bone,	58	3.61	.....	22.86
Tankage,	47	6.256	.....	14.25
Ground fish,	39	8.056	.....	6.496
Cottonseed meal,	295	6.58	.....	.....
Sulphate of potash,	13	.....	49.61	.....
Muriate of potash,	71	.....	50.93	.....
Kainit,	22	.....	13.75	.....
Double sulphate of potash and magnesia,	7	.....	27.174	.....

Composition of Acidulated Fertilizer Ingredients. Per Cent.)

	Number of samples.	Total phosphoric acid.	Insoluble phosphoric acid.	Nitrogen.
Dissolved bone,	10	14.91	4.51	1.59
Dissolved phosphate rock,	79	15.60	97	.....

Cost per Pound of Fertilizer Constituents.—With the composition of these raw materials and their price per ton, hundred weight, or other unit of measure as a basis, the wholesale cost per pound of the valuable constituents can readily be calculated. In many cases the ammoniates are quoted “per unit of ammonia,” the term unit being equivalent to per cent.; in goods sold by the ton of 2,000 lbs., the unit is equal to 20 lbs., and 20 lbs. of ammonia contain 16.47 lbs. of nitrogen.

In the case of refuse bone-black, unacidulated the mean, 28.25 per cent. of phosphoric acid, is assumed to represent the average material on the market.

Phosphate rock is sold by the ton of 2,240 lbs., and on the basis of the bone phosphate of lime it contains, with drawbacks for injurious constituents. Bone-phosphate of lime contains 45.8 per cent. of phosphoric acid; therefore, each per cent. of bone phosphate in a long ton is equivalent to 22.4 lbs., and contains 10.26 lbs. of phosphoric acid.

In the wholesale trade, dried blood, azotine, concentrated tankage and hoof meals are usually sold on the basis of ammonia, disregarding the phosphoric acid present.

Insoluble phosphoric acid in dissolved rock is likewise omitted from consideration, contracts being based solely upon the “available” phosphoric acid; nor in rock phosphates is any claim made for the small quantities of nitrogen and potash they contain, nor in dissolved bone for the potash present.

Under these conditions, the wholesale cost per pound in New York of the valuable constituents of such materials as furnish but a single fertilizing element, these materials being assumed to be in the state of preparation and in the packing in which the manufacturer purchased them, are given in the following table; also a figure representing a fair retail price at the factory, the materials having undergone no change in treatment or packing and the allowance for expenses and profit in retailing being 20 per cent.

Wholesale Cost per Pound of Fertilizing Constituents, New York.

1. Ingredients Supplying One Constituent.

Materials.	Constituents Valued.	Wholesale price. Cents.	Wholesale price plus 20 per cent. Cents.
Sulphate of ammonia,	Nitrogen,	14.54	17.45
Nitrate of soda,	Nitrogen,	14.94	17.93
Dried blood,	Nitrogen,	18.88	22.66
Concentrated tankage,	Nitrogen,	16.75	20.10
Phosphate rock, Tenn., 78 per cent.,	Phosphoric acid, total)* .....	.66	.79
Acid phosphate,	Phosphoric acid, available,	2.62	3.14
Double sulphate of potash and magnesia, ...	Potash,	4.60	5.50
Sulphate of potash,	Potash,	4.74	5.69
Kalnit,	Potash,	3.06	3.67
Muriate of potash,	Potash,	3.76	4.41

*The prices of phosphate rock are f. o. b. at the respective points of shipment, not New York. The prices for potash are taken from the schedule of the syndicate, and those of the remainder from the Oil, Paint and Drug Reporter.

The quotations for bone are given without specific reference to quality, so that it is impossible, from these data, fairly to apportion their several wholesale values to the nitrogen and phosphoric acid contained in this material. As compared with tankage, the general tendency is to assign a higher commercial rating to the phosphoric acid in bone, and to the nitrogen, a rating not very different from that given in tankage.

In former years, the value assigned to the bone nitrogen has been the same as that quoted on crushed tankage, c. a. f. Baltimore. In later years, quotations for both crushed tankage and ground tankage have not been available, and for that reason, the value of bone nitrogen is based upon the quotations for concentrated tankage.

In earlier years, quotations on ground tankage have been about 5 per cent. in advance of those on concentrated tankage; also quotations on crushed tankage were on an average 12.67 per cent. in advance of those on ground tankage. Increasing the price of concentrated tankage by these percentages, we have \$3.27 per unit of ammonia as the value assigned to the nitrogen in bone.

This is equivalent to \$3.97 per unit of nitrogen.

The average composition of the ground bone and bone meal samples analyzed last year in Pennsylvania was: Phosphoric acid, 22.86 per cent.; nitrogen 3.61 per cent.

The prepared bone contains less fat and moisture, and often less nitrogen than the ordinary rough bone, but these differences tend, in a measure, to neutralize each other. Assuming for the rough bone quoted in the New York market the same composition as the bone meal sold in Pennsylvania, and for the value of the nitrogen \$3.97 per unit, as previously stated, the values per pound of the several constituents would be:

Wholesale Cost per Pound of Fertilizer Constituents, New York.

II. Bone.

Materials.	Constituents Valued.	Cents.	
		Wholesale price.	Wholesale price, plus 20 per cent.
Rough bone,	{ Nitrogen,	19.85	23.82
	{ Phosphoric acid,	1.94	2.37
Ground bone,	{ Nitrogen,	19.85	23.81
	{ Phosphoric acid,	3.25	3.94

Valuation in Neighboring States.

It is desirable, from all points of view, that the schedules of valuation throughout a district in which similar market conditions prevail, should differ as little as possible. It has been our practice in the past, to conform our schedule to that adopted after very careful cooperative study of the market conditions for each year, by the New England States, New York and New Jersey, except where the peculiar conditions of our markets have been made the valuations diverge too largely from the actual selling prices, as in the case of ground bone and dissolved rock phosphates. The schedules for these States for 1903 and 1914 are as follows:

Trade Values Adopted by the New England States and New Jersey.

	Cents Per Pound.		Values in 1914 in per cent. of those in 1913.
	1913.	1914.	
Nitrogen:			
In nitrates,	18½	16½	89.2
In ammonium salts,	18½	16½	89.2
In dry and fine ground fish and dried blood,	20	22½	112.5
In fine bone and tankage,	19	21½	113.2
In coarse bone and tankage,	15	17½	116.7
In mixed fertilizers,	19	19½	102.6
Phosphoric acid:			
Water soluble,	4½	4½	100.0
Citrate soluble,	4	4	100.0
In fine ground bone and tankage,	4	4	100.0
In coarse bone and tankage,	3½	3½	100.0
In mixed fertilizers, insoluble,	2	2	100.0
Potash:			
In forms free from muriate,	5½	5	96.2
As muriate,	4½	4	94.1

Valuations in Pennsylvania.

For reasons stated on the previous page, the New England schedule has been followed in the case of mixed fertilizers and dissolved bones.

In the case of the dissolved rocks, the wholesale prices of raw materials used in their manufacture and of the available phosphoric acid itself, having shown no material change, the values used in the Pennsylvania schedule for 1913 are continued for use during the present year.

With respect to the potash and nitrate salts, the experience of recent years has shown a growing increase in the proportion of the official samples that represent direct cash purchases in large quantities. The result has been that the commercial valuations, based upon the conditions and costs of sale in small quantities, through local agents and on time, came to be, in a large fraction of the cases represented by these salts whose analyses are reported in the miscellaneous group, strikingly higher than the selling prices quoted. *For this reason, it has appeared needful to proceed, hereafter, upon the assumption that all potash and nitrate salts sold unmixed as such, have been purchased at what are virtually jobbers' prices plus freight, and to adopt corresponding pound values. In the case, however, of potash and nitrogen in mixed fertilizers, the computation will be made as heretofore, upon the assumed basis of sale on time, in small quantities and through local dealers.*

Buyers who are interested in the comparative jobbing prices of other materials, will find the data in the preceding pages.

The entire schedule adopted for use in this State is presented in the following table.

Pennsylvania Schedule of Values for Fertilizer Ingredients, 1914.

	Cents Per Pound.
Nitrogen:	
In ammonia salts,	16½
In nitrates,	16½
In meat, dried blood, etc.,	22½
In mixed fertilizers,	19
In fine ground bone and tankage,	17
In coarse bone and tankage,	15
Phosphoric Acid:	
Available, in bone fertilizers,	4½
Available, in rock fertilizers,	3
Insoluble in ammonium citrate, in bone fertilizers,	2
Insoluble in ammonium citrate, in rock fertilizers,	1½
In fine bone, tankage and fish,	3½
In coarse bone and tankage,	2½
Potash:	
In high grade sulphate of other forms free from muriate,	5
As muriate,	4

Potash in excess of that equivalent to the chlorin present, will be valued as sulphate, and the remainder as muriate. The analytical tables frequently show little or no potash reported as sulphate, although the full percentage guaranteed is reported present, and although the manufacturer has guaranteed that it was introduced as

sulphate. This discrepancy between analytical report and guaranty may be due to the rule of practice stated in the first sentence of this paragraph, and not to any act of bad faith on the part of the manufacturer. The rule of practice is adopted chiefly for the reason that plants injured, like tobacco and sometimes potatoes, by an excess of chlorin, is injured equally, whether the chlorin be introduced as muriate of potash, as common salt, or as magnesium chloride. At present prices for the two potash salts, muriate and sulphate, the only weighty reason for introducing the more costly sulphate, is to insure the purchaser of tobacco and potato fertilizers against possible injury by chlorin. Under our system of valuation, the manufacturer must exclude chlorin from every source to gain the valuation advantage from his use of sulphate of potash.

In certain cases where specific claim is made by the manufacturer that potash has been added as carbonate, potash in excess of that equivalent to soluble chlorides and soluble sulphates will be valued as carbonate.

Nitrogen in mixed fertilizers will be valued as derived from the best sources of organic nitrogen, unless clear evidence to the contrary is obtained.

Phosphoric acid in mixed fertilizers is valued at bone phosphoric acid prices, unless clearly found to be derived from rock phosphate.

Bone is sifted into two grades of fineness: Fine, less than 1-50 inch in diameter; coarse, over 1-50 inch in diameter.

The result obtained by the use of this schedule does not cover the items of mixing, bagging, freight and agents' commission. To cover these, allowances are made as follows:

For bagging, an allowance of \$1.00 per ton on all fertilizers, except when sold in original packages.

For mixing, an allowance of \$1.00 per ton on complete fertilizers and rock-and-potash goods.

For agents' commission, an allowance of 20 per cent. is added to the cash value of the goods ready for shipment.

For freight, an allowance of \$2.00 per ton on all fertilizers.

FERTILIZERS ANALYSES JANUARY 1 TO AUGUST 1, 1914.

Since January 1, 1914, there have been received from authorized sampling agents two thousand and ninety-four fertilizer samples, of which seven hundred and fifty-one were subjected to analysis. Preference was given to those which have not been recently analyzed. In cases where two or more samples representing the same brand were received, equal portions from several samples were united, and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 505 complete fertilizers, furnishing phosphoric acid, potash and nitrogen; 4 dissolved bones, furnishing phosphoric acid and nitrogen; 131 rock and potash fertilizers, furnishing phosphoric acid and potash; 30 acidulated rock phosphates, furnishing phosphoric acid only; 23 ground bones, furnishing phosphoric acid and nitrogen, and 58 miscellaneous samples, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total and insoluble; the latter is, that portion not soluble in water nor in warm ammonium citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called “available” phosphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen — This element is determined in such manner as to ascertain its *total* quantity and also, beginning with the present season, the quality of the organic nitrogenous material present in the finished fertilizer. The fertilizer is washed thoroughly with water, which removes the nitrates, ammonium salts and almost all of the cyanamid nitrogen, and the soluble organic nitrogenous materials. These are not separately determined, but are grouped under the name “*water-soluble nitrogen*.” The quantity of *water-insoluble nitrogen* is directly determined, and by difference between its amount and the total nitrogen, the water soluble nitrogen is calculated. Another portion of water-insoluble material* is treated with alkaline potassium permanganate, which attacks the nitrogenous organic substances present, and converts the more active portion into ammonia, which is distilled off, determined, and its nitrogen calculated as “*active insoluble nitrogen*.” The “*inactive insoluble nitrogen*” is then computed by subtracting the active insoluble from the total insoluble nitrogen. The term “available nitrogen” as used in this report, is the sum of the water-soluble and the active insoluble nitrogen. It is equivalent to the total nitrogen less the inactive insoluble nitrogen. In high grade organic nitrogenous mater-

*This determination has been omitted in all cases where the insoluble nitrogen is only .2 per cent. or less.

ials, among which, from its behavior with this treatment, must be included horn meal, the percentage of inactive nitrogen in the insoluble nitrogen is usually under 40 per cent.; and the ratio of inactive to active insoluble nitrogen in such materials is usually less than 60:100. On the other hand, in the case of low-grade nitrogenous materials, the proportions of inactive nitrogen are much higher. The separations effected by these methods are therefore of great value in distinguishing whether the insoluble nitrogen is derived from high grade materials, or from low grade substances such as garbage tankage, peat, mora meal, unacidulated hair, leather, etc. There is, however, one fertilizer ingredient rapidly coming into use, whose presence may lead to erroneous conclusion, if judgment is based solely upon the facts ascertained by the foregoing method, namely, cyanamid. This substance contains from 13 to 16.5 per cent. of nitrogen, of which 12 to 14.7 per cent. is soluble in water, by the mode of treatment used in the alkaline permanganate method; and, of the 1.0 to 1.7 per cent. of water-insoluble nitrogen, less than one-fifth is active; so that the ratio of inactive to insoluble nitrogen is about 80:100. Owing to its tendency to reduce the availability of the phosphoric acid in acid phosphate mixtures, limited quantities only of this ingredient can be used advantageously in mixed fertilizers. Nevertheless, in cases where low grade sources of nitrogen are indicated by the foregoing method, it would be needful to determine, by supplementary tests, whether or not cyanamid may be present to account for an undue proportion of inactive, insoluble nitrogen, before concluding that such excess of inactive nitrogenous material is attributable to low-grade nitrogenous constituents. It is desirable to keep in mind at this point the fact also that certain widely used low-grade nitrogenous substances, such as garbage tankage, peat and mora meal, are not included in the list of substances whose presence requires specific declaration under Section 4 of the Fertilizer Act. (5) CHLORIN—this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of sub-division is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depend very largely on the fineness of its particles, the finer being much more quickly useful to the plant.

The legislation of 1909 has made needful, some additional tests. Section 4, of the Act of May 1, 1909, prohibits the sale of "pulverized leather, hair, ground hoof, horn, or wool waste, raw, steamed, roasted, or in any form, as a fertilizer, or as an ingredient of a fertilizer or manure, without an explicit statement of the fact." All nitrogenous fertilizers have, therefore, been submitted to a careful microscopic examination, at the time of preparing the sample for analysis, to detect the presence of the tissues characteristic of the several materials above named. The act of April 23, 1909, makes it unlawful to use the word "bone" in connection with, or as part of the

name of any fertilizer, or any brand of the same, unless the phosphoric acid contained in such fertilizer shall be the product of pure animal bone. All fertilizers in whose name the word "bone" appears, were therefore examined by microscopic and chemical methods to determine, so far as possible with present knowledge, the nature of the ingredient or ingredients supplying the phosphoric acid. It is a fact, however, well known to fertilizer manufacturers and which should be equally understood by the consumer, that it is, in certain cases, practically impossible to determine the source of the phosphoric acid by an examination of the finished fertilizer. The microscope shows clearly the structure of raw bone, but does not make it possible to discriminate between thoroughly acidulated bone and acidulated rock. The ration of nitrogen to phosphoric acid in a raw bone—and only such bone as has not been deprived of any considerable proportion of its nitrogenous material by some manufacturing process can properly be called "pure animal bone"—is about 1: 8, in cases where the ration of nitrogen to phosphoric acid exceeds 8, it is clear that part, at least, of the phosphoric acid has been supplied by something else than pure animal bone; but, inasmuch as nitrogen may have been introduced in some material other than bone and no longer detectible by the microscope, the presence of nitrogen and phosphoric acid in the proportions corresponding to those of bone is not proof positive that they have been supplied by bone. Finally, the difference in the iron and silica content of bone and rock respectively, afford means of distinction useful in some cases; the usefulness of this distinction is limited, however, by the facts that kitchen bone frequently contains earthy impurities rich in iron and silica, and that earthy filler can legally be used in fertilizers and are in fact considerably used therein both as "making-weights" and as "conditioners," or materials introduced to improve the drilling qualities of the goods. The fact that the phosphoric acid in bone and rock are identical in character is probably so well known as to require no detailed consideration in this connection.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guarantees stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown up among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of valuable constituent ranging from a certain minimum to a much higher maximum; thus, "Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guarantees filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guarantees for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric

acid, the sum of the lowest figures given by him for soluble and re-verted phosphoric acid is used. The law of 1879 allowed the maker to express his guaranty for nitrogen either in terms of that element or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen. The law of 1901 and 1909 abolished the alternative and required that the quantity shall be given in terms of nitrogen.

Many manufacturers after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables:

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made this Season. (Spring 1914).

	Complete fertilizer.	Rock and potash.	Dissolved bone.	Dissolved rock.	Ground bone.
Number of analyses,	505	131	4	30	23
Moisture, per cent.,	8.85	9.69	6.89	9.21	5.11
Phosphoric acid:					
Total, per cent.,	9.31	10.63	15.84	15.53	21.34
Available, per cent.,	8.06	9.76	10.45	14.47	.....
Insoluble, per cent.,	1.25	.87	5.39	.84	.....
Potash, per cent.,	5.67	4.77	.....	.....	.....
Nitrogen:					
Total, per cent.,	1.81	.....	2.38	.....	3.08
Available, per cent.,	1.49	.....	2.38	.....	3.08
Available, per cent.,	1.49	.....	1.98	.....	.....
Inactive insoluble, per cent., .....	.32	.....	.40	.....	.....
Mechanical analyses of bone:					
Fine, per cent., .....	.....	.....	.....	.....	49.00
Coarse, per cent., .....	.....	.....	.....	.....	51.00
Commercial valuation,*	\$26.93	\$15.60	\$27.28	\$13.71	\$30.15
Selling price,*	24.72	16.79	26.25	14.48	31.43

*Dollars per ton.

“For the purpose of indicating more specifically to the eye, cases deficient in guarantee, an asterisk has been affixed in the analytical tables where the ingredient has been found less in quantity than the manufacturer guaranteed. Too great emphasis should not be placed upon very slight deficiencies, because very slight imperfections in mixing and slight variation in analysis are practically unavoidable. The asterisk has been used, therefore, only in cases where the deficiencies amount to 0.2 per cent. or more, except where nitrogen has been guaranteed in amounts not higher than 1.0 per cent. in which case an asterisk has been affixed where the deficiency amounts to 0.1 per cent. or more.”

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which it amounted to two-tenths per cent, or more, were as follows:

Summary of Instances of Deficiency from Guaranty.

	Complete fertilizer	Rock and potash	Dissolved bone	Dissolved rock	Ground bone
Deficient in four constituents,	0	0	0	0	0
Deficient in three constituents,	3	.....	.....	.....	.....
Deficient in two constituents,	39	10	.....	3	.....
Deficient in one constituent,	129	25	2	4	11
Total number of samples in which deficiencies occur,....	167	35	2	7	11

The cases of deficiency noted during the past eleven seasons in the composition of goods as compared with their guaranties, expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency 1909-1914.

	Spring, 1909	Fall, 1909	Spring, 1910	Fall, 1910	Spring, 1911	Fall, 1911	Spring, 1912	Fall, 1912	Spring, 1913	Fall, 1913	Spring, 1914
Complete fertilizer, ..	39.5	46.3	23.9	35.9	45.1	46.9	39.0	36.8	32.3	36.0	33.1
Dissolved bone,	25.0	*	37.5	25.0	16.6	100.00	50.0	50.0	50.0	66.7	50.0
Rock and potash,	36.2	30.4	25.2	37.0	27.1	43.4	33.6	38.9	26.4	46.0	26.7
Dissolved rock,	33.3	19.5	4.3	6.3	5.9	11.9	12.5	16.7	20.9	22.5	23.3
Ground bone,	20.8	38.4	29.17	27.6	47.8	20.0	29.2	32.1	25.0	22.2	47.8
All classes except miscellaneous,	37.6	39.6	26.5	33.5	38.7	46.0	36.0	35.7	30.4	35.0	32.0

*Only two samples analyzed for which no guarantees are reported.

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past, including those of this season, follows:

Average Composition and Guaranty Compared.

	Average composition. per cent.	Per Average guaranty. cent.
Spring, 1909.		
Phosphoric acid:		
Total,	9.83	8.98
Available,	8.07	7.66
Potash,	5.07	4.89
Nitrogen,	1.67	1.60
Fall, 1909.		
Phosphoric acid:		
Total,	10.13	9.34
Available,	8.27	8.08
Potash,	3.41	3.12
Nitrogen,	1.33	1.26
Spring, 1910.		
Phosphoric acid:		
Total,	9.80	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Fall, 1910.		
Phosphoric acid:		
Total,	9.72	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Spring, 1911.		
Phosphoric acid:		
Total,	9.68	8.96
Available,	8.31	7.86
Potash,	4.97	4.65
Nitrogen,	1.53	1.54
Fall, 1911.		
Phosphoric acid:		
Total,	9.59	9.09
Available,	8.20	7.87
Potash,	3.63	3.39
Nitrogen,	1.12	1.19
Spring, 1912.		
Phosphoric acid:		
Total,	9.51	8.82
Available,	8.09	7.78
Potash,	5.34	5.05
Nitrogen,	1.58	1.58
Fall, 1912.		
Phosphoric acid:		
Total,	9.90	9.07
Available,	8.28	7.83
Potash,	4.06	3.57
Nitrogen,	1.28	1.30
Spring, 1913.		
Phosphoric acid:		
Total,	9.71	8.92
Available,	8.11	7.37
Potash,	5.41	5.17
Nitrogen,	1.61	1.62
Fall, 1913.		
Phosphoric acid:		
Total,	9.86	9.09
Available,	8.06	7.83
Potash,	4.28	4.27
Nitrogen,	1.47	1.35
Spring, 1914.		
Phosphoric acid:		
Total,	9.31	8.71
Available,	8.06	7.65
Potash,	5.67	5.52
Nitrogen,	1.91	1.69

MATERIALS USED IN FERTILIZERS.

The sampling agents report no case of declaration under the requirements of Section 4 of the fertilizer law, nor has microscopic examination shown any decisive evidence of the presence in any fertilizer of more than accidental traces of any of the substances specified in that section.

On the other hand, the results of the examination of the condition of the nitrogen in the complete fertilizers by the alkaline permanganate method affords much that is suggestive.

To keep the tables down to convenient size, the percentages of active insoluble nitrogen found have been omitted. They can be computed, however, from the figures given, by deducting from the total nitrogen the sum of the soluble and the inactive insoluble nitrogen. The ratio which the active insoluble bears to the inactive insoluble nitrogen being the principal indication the method as here used gives respecting the character of the organic nitrogenous ingredients of the fertilizer, the index letters, 'a', 'b', and 'c', have been affixed to the percentages of inactive insoluble nitrogen, to indicate the ratios between the active and inactive insoluble in the several samples. Cases in which the active constitutes three-fifths or more of the insoluble are marked 'a'; two-fifths to three-fifths, 'b', and less than two-fifths, 'c.' The New England Stations used the terms 'good,' 'doubtful' and 'poor' for these respective classes of cases.

Of the 503 samples examined this season, 83 belong to class 'a', 336 to 'b', and 84 to 'c'.

It is needful to keep clearly in mind the meaning of the index 'c' as thus applied. Its presence does not suffice to indicate that the fertilizer contains no readily available nitrogen, but merely that part or all of the insoluble nitrogen is derived from low grade sources, barring cases in which cyanamid is one of the fertilizer ingredients. These low-grade materials may be such as are listed in Section 4 of the law, or others in common use, such as garbage tankage, peat or mora meal; and they may, if of animal origin, have had their nitrogenous materials changed almost entirely to an available condition by 'wet mixing,' which has, however, little improving effect upon the nitrogenous constituents of garbage tankage and mora meal, and little more upon those of peat.

The use of such low-grade materials is either to make the fertilizer less likely to become sticky or lumpy, or to supply nitrogen from materials that would otherwise be wholly thrown to waste. The use of 'conditioners' for the former purpose is, in itself, desirable rather than objectionable; but becomes obnoxious and unjust when the nitrogen they contain in unavailable form is made the basis of a charge at high rates to the buyer. The use also of low-grade and therefore cheap nitrogen supplies whose nitrogen has, by chemical treatment, been made useful for plant-food, is laudable provided the materials are sold for what they are, instead of being sold at the prices of the nitrogen in high-grade nitrogenous ingredients.

In cases where the inactive insoluble nitrogen forms a large fraction of the total nitrogen, is marked by the index 'c,' the guaranty

does not exceed the available nitrogen by an amount equal to most of the 'inactive,' and the selling price, corrected for freight difference, is not considerably less than that asked for fertilizers of like general composition but supplying nitrogen derived from high-grade goods such as bear the index 'a' or even 'b,' there is a reason to believe that the buyer is being subjected to unfair treatment.

Section 1 of the Fertilizer Law of 1909 requires that the guaranty for a fertilizer shall state 'the percentage such fertilizer contains of nitrogen in an available form.' It is, however, by no means clear that the term 'available,' as used in the law, means precisely the same thing that is meant by that term when used to designate the sum of the water-soluble and active insoluble nitrogen, as determined by the present method. For some nitrogenous fertilizer ingredients always regarded as of high grade, such as dried blood, meat tankage, and cottonseed meal, contain considerable fractions of inactive insoluble nitrogen when examined by this method. Until further notice, therefore, the law will not be construed to require that the amount of nitrogen guaranteed shall not exceed that present in a form that will appear as 'available' by the alkaline permanganate method now in use.

In many of this season's samples, however, the quantity of nitrogen thus available is found equal to the percentage guaranteed. On the average, the 'available' nitrogen found was 1.49 per cent. the total, 1.81, that guaranteed, 1.69 per cent.

FERTILIZERS ANALYSES AUGUST 1 TO DECEMBER 31, 1914.

Since August 1, 1914, there have been received from authorized sampling agents eleven hundred and eighty-four fertilizer samples, of which four hundred and fifty were subjected to analysis. Preference was given to those which have not been recently analyzed. In cases where two or more samples representing the same brand were received, equal portions from several samples were united, and the composite sample was subjected to analysis.

The samples analyzed group themselves as follows: 281 complete fertilizers, furnishing phosphoric acid, potash and nitrogen 2 dissolved bones, furnishing phosphorous acid and nitrogen; 99 rock-and-potash fertilizers, furnishing phosphoric acid and potash; 38 acidulated rock phosphates, furnishing phosphoric acid only; 23 ground bones, furnishing phosphoric acid and nitrogen, and 7 miscellaneous samples, which group includes substances not properly classified under the foregoing heads.

The determinations to which a complete fertilizer is subjected are as follows: (1) Moisture, useful for the comparison of analyses, for indication of dry condition and fitness for drilling, and also of the conditions under which the fertilizer was kept in the warehouse. (2) Phosphoric acid—total and insoluble; the latter is, that portion not soluble in water nor in warm ammonium citrate solution (a solution supposed to represent the action of plant roots upon the fertilizer), which is assumed to have little immediate food value. By difference, it is easy to compute the so-called “available” phosphoric acid. (3) Potash soluble in water—most of that present in green sand marl and crushed minerals, and even some of that present in vegetable materials such as cotton-seed meal, not being included because insoluble in water even after long boiling. (4) Nitrogen—This element is determined in such manner as to ascertain its *total* quantity and also, beginning with the present season, the quality of the organic nitrogenous material present in the finished fertilizer. The fertilizer is washed thoroughly with water, which removes the nitrates, ammonium salts and almost all of the cyanamid nitrogen, and the soluble organic nitrogenous materials. These are not separately determined, but are grouped under the name “*water-soluble nitrogen*.” The quantity of *water-insoluble nitrogen* is directly determined, and by difference between its amount and the total nitrogen, the water-soluble nitrogen is calculated. Another portion of water-insoluble material* is treated with alkaline potassium permanganate, which attacks the nitrogenous organic substances present, and converts the more active portion into ammonia, which is distilled off, determined, and its nitrogen calculated as “*active insoluble nitrogen*.” The “*inactive insoluble nitrogen*” is then computed by subtracting the active insoluble from the total insoluble nitrogen. The term “available nitrogen” as used in this report, is the sum of the water-soluble and the active insoluble nitrogen. It is equivalent to the total nitrogen less the inactive insoluble nitrogen. In high grade organic nitrogenous materials, among which, from its behavior with this treatment, must be included horn meal, the percentage of inactive nitrogen in the insolu-

*This determination has been omitted in all cases where the insoluble nitrogen is only .2 per cent. or less.

able nitrogen is usually under 40 per cent; and the ratio of inactive to active insoluble nitrogen in such materials is usually less than 60:100. On the other hand, in the case of low-grade nitrogenous materials, the proportions of inactive nitrogen are much higher. The separations effected by these methods are therefore of great value in distinguishing whether the insoluble nitrogen is derived from high grade materials, or from low grade substances such as garbage tankage, peat, mora meal, unacidulated hair, leather, etc. There is, however, one fertilizer ingredient rapidly coming into use, whose presence may lead to erroneous conclusion, if judgment is based solely upon the facts ascertained by the foregoing method, namely, cyanamid. This substance contains from 13 to 16.5 per cent. of nitrogen, of which 12 to 14.7 per cent. is soluble in water, by the mode of treatment used in the alkaline permanganate method; and, of the 1.0 to 1.7 per cent. of water-insoluble nitrogen, less than one-fifth is active; so that the ratio of inactive to insoluble nitrogen is about 80:100. Owing to its tendency to reduce the availability of the phosphoric acid in acid phosphate mixtures, limited quantities only of this ingredient can be used advantageously in mixed fertilizers. Nevertheless, in cases where low grade sources of nitrogen are indicated by the foregoing method, it would be needful to determine, by supplementary tests, whether or not cyanamid may be present to account for an undue proportion of inactive, insoluble nitrogen, before concluding that such excess of inactive nitrogenous material is attributable to low-grade nitrogenous constituents. It is desirable to keep in mind at this point the fact also that certain widely used low-grade nitrogenous substances, such as garbage tankage, peat and mora meal, are not included in the list of substances whose presence requires specific declaration under Section 4 of the Fertilizer act. (5) Chlorin—this determination is made to afford a basis for estimating the proportion of the potash that is present as chlorid or muriate, the cheaper source. The computation is made on the assumption that the chlorin present, unless in excess, has been introduced in the form of muriate of potash; but doubtless there are occasional exceptions to this rule. One part of chlorin combines with 1.326 parts of potash to form the pure muriate; knowing the chlorin, it is, therefore, easy to compute the potash equivalent thereto. (7) In the case of ground bone, the state of sub-division is determined by sifting through accurately made sieves; the cost of preparation and especially the promptness of action of bone in the soil depend very largely on the fineness of its particles, the finer being much more quickly useful to the plant.

The legislation of 1909 has made needful some additional tests. Section 4, of the Act of May 1, 1909, prohibits the sale of pulverized leather, hair, ground hoof, horns, or wool waste, raw, steamed, roasted, or in any form, as a fertilizer, or as an ingredient of a fertilizer or manure, without an explicit statement of the fact." All nitrogenous fertilizers have, therefore, been submitted to a careful microscopic examination, at the time of preparing the sample for analysis, to detect the presence of the tissue characteristic of the several materials above named. The act of April 23, 1909, makes it unlawful to use the word "bone" in connection with, or as part of the name of any fertilizer, or any brand of the same, unless the phosphoric acid contained in such fertilizer shall be the product of pure animal

bone. All fertilizers in whose name the word "bone" appears, were therefore examined by microscopic and chemical methods to determine, so far as possible with present knowledge, the nature of the ingredient or ingredients supplying the phosphoric acid. It is a fact, however, well known to fertilizer manufacturers and which should be equally understood by the consumer, that it is, in certain cases, practically impossible to determine the source of the phosphoric acid by an examination of the finished fertilizer. The microscope shows clearly the structure of raw bone, but does not make it possible to discriminate between thoroughly acidulated bone and acidulated rock. The ration of nitrogen to phosphoric acid in a raw bone—and only such bone as has not been deprived of any considerable proportion of its nitrogenous material by some manufacturing process can properly be called "pure animal bone"—is about 1: 8, in cases where the ration of phosphoric acid to nitrogen exceeds 8, it is clear that part, at least, of the phosphoric acid has been supplied by something else than pure animal bone; but, inasmuch as nitrogen may have been introduced in some material other than bone and no longer detectible by the microscope, the presence of nitrogen and phosphoric acid in the proportions corresponding to those of bone is not proof positive that they have been supplied by bone. Finally, the differences in the iron and silica content of bone and rock respectively, afford means of distinction useful in some cases; the usefulness of this distinction is limited, however, by the facts that kitchen bone frequently contains earthy impurities rich in iron and silica, and that earthy fillers can legally be used in fertilizers and are in fact considerably used therein both as "make-weights" and as "conditioners," or materials introduced to improve the drilling qualities of the goods. The fact that the phosphoric acid in bone and rock are identical in character is probably so well known as to require no detailed consideration in this connection.

The law having required the manufacturer to guarantee the amount of certain valuable ingredients present in any brand he may put upon the market, chemical analysis is employed to verify the guaranties stamped upon the fertilizer sacks. It has, therefore, been deemed desirable in this report to enter the guaranty filed by the manufacturer in the office of the Secretary of Agriculture, in such connection with the analytical results that the two may be compared. An unfortunate practice has grown among manufacturers of so wording the guaranty that it seems to declare the presence in the goods of an amount of valuable constituent ranging from a certain minimum to a much higher maximum; thus, Potash, 2 to 4 per cent." is a guaranty not infrequently given. In reality, the sole guaranty is for 2 per cent. The guaranteed amounts given for each brand in the following tables, are copied from the guaranties filed by the maker of the goods with the Secretary of Agriculture, the lowest figure given for any constituent being considered to be the amount guaranteed. For compactness and because no essentially important fact is suppressed thereby, the guaranties for soluble and reverted phosphoric acid have not been given separately, but are combined into a single guaranty for available phosphoric acid; in cases where the maker's guaranty does not specifically mention available phosphoric acid, the sum of the lowest figures given by him for soluble and reverted phosphoric acid is used. The law of 1897 allowed the maker to express his guaranty for nitrogen either in terms of that element

or in terms of the ammonia equivalent thereto; since ammonia is composed of three parts of hydrogen and fourteen parts of nitrogen, it is a very simple matter to calculate the amount of one, when the amount of the other is given; the amount of nitrogen multiplied by 1.214 will give the corresponding amount of ammonia, and the amount of ammonia multiplied by 0.824 will give the corresponding amount of nitrogen. In these tables, the expression is in terms of nitrogen. The laws of 1901 and 1909 abolished the alternative and required that the quantity shall be given in terms of nitrogen.

Many manufacturers, after complying with the terms of the law, insert additional items in their guaranties, often with the result of misleading or confusing the buyer; the latter will do well to give heed to those items only that are given as the law requires and that are presented in these tables:

A summary of the analyses made this season may be presented as follows:

Summary of Analyses Made this Season.

	Complete fertilizer	Rock and potash	Dissolved bone	Dissolved rock	Ground bone
Number of analyses,	281	99	2	33	23
Moisture, per cent,	5.83	8.80	7.54	8.24	5.19
Phosphoric acid:					
Total, per cent.,	9.84	11.18	11.95	15.52	23.37
Available, per cent.,	8.41	10.35	11.07	14.38	.....
Insoluble, per cent.,	1.43	.83	.88	1.14	.....
Potash, per cent.,	3.42	3.50	.....	.....	.....
Nitrogen, per cent.,	1.39	.....	.89	.....	.....
Mechanical analyses of bone:					
Fine, .....	.....	.....	.....	.....	55.00
Coarse, .....	.....	.....	.....	.....	45.00
Commercial valuation,*	\$22 64	\$15 42	\$19 02	\$13 97	\$33 45
Average selling price,*	20 83	15 21	16 05	13 75	32 20

*Dollars per ton.

The European war brought fertilizer manufacturers face to face with a serious difficulty just before the time had arrived for the filling of the fall trade orders, namely, the cutting off of the supply of German potash salts, the sole commercial source of fertilizer potash for the northern United States. The manufacturing trade made a re-adjustment to eke out their potash stocks by reducing the guaranties for certain brands rich in potash, by withdrawing almost entirely their offers of potash salts for home-mixing, and by greatly increasing the prices of these salts when sold for that purpose. Where sufficient supplies of a brand were already mixed, no changes of guaranty were made. Those brands with changed potash guaranty that are represented in this season's analyses are indicated by the printing of the potash guaranty in italics, in the analytical tables following.

No change has been made in the potash values used in calculating the "commercial valuations."

The average potash percentages, commercial valuations and selling prices for the brands analyzed in the fall of 1913 and during the present season, are as follows:

	1913		1914	
	Complete	Rock and potash	Complete	Rock and potash
Potash, per cent.,	4.28	4.70	3.42	3.50
Commercial valuations,	\$24 36	\$16 85	\$22 64	\$15 42
Average selling price,	21 52	16 25	20 83	15 21

The average potash percentages in the 1914 fall goods are about one per cent. less than in 1913 fall goods, and the selling prices are correspondingly less. This means that, for the fall trade of this year, the manufacturers have not materially changed their charges for the potash contained in mixed fertilizers. The selling prices of the comparatively few lots of potash salts found upon the market and represented by figures in the table of miscellaneous analyses show, on the other hand, a very large price increase, though by no means the highest of those here and there given this season for such materials.

It is deserving of comment that the deficiencies in potash are not greater in number than in preceding seasons.

For the purpose of indicating more specifically to the eye, cases deficient from guaranty, an asterisk has been affixed in the analytical tables where the ingredient has been found less in quantity than the manufacturer guaranteed. Too great emphasis should not be placed upon very slight deficiencies, because very slight imperfections in mixing and slight variation in analysis are practically unavoidable. The asterisk has been used, therefore, only in cases where the deficiencies amount to 0.2 per cent. or more except where nitrogen has been guaranteed in amounts no higher than 1.0 per cent., in which case an asterisk has been affixed where the deficiency amounts to 0.1 per cent. or more.

The cases of departure of goods from their guaranteed composition observed this season, including only those cases in which an asterisk has been affixed, were as follows:

Summary of Instances of Deficiency from Guaranty.

	Complete fertilizer	Rock and potash	Disoslved bone	Dissolved rock	Ground bone
Deficient in four constituents,	1	0	0	0	0
Deficient in three constituents,	1	2	0	0	0
Deficient in two constituents,	20	8	0	0	0
Deficient in one constituent,	52	24	0	7	7
Total number of samples in which deficiencies occur,	94	34	0	7	7

The cases of deficiency noted during the past nine seasons in the composition of goods as compared with their guaranties, expressed in percentage of the total number of goods of each class analyzed, are as follows:

Percentage of Deficiency, 1910-1914.

	Spring, 1910	Fall, 1910	Spring, 1911	Fall, 1911	Spring, 1912	Spring, 1913	Fall, 1913	Spring, 1914	Fall, 1914
Complete fertilizers,	28.9	35.9	45.1	46.9	39.0	32.3	36.0	33.1	27.1
Dissolved bone,	37.5	25.0	16.6	100.00	50.0	50.0	66.7	50.0	0.0
Rock and potash,	25.2	37.0	27.1	43.4	33.6	26.4	46.0	26.7	35.8
Dissolved rock,	4.3	6.3	5.9	11.9	12.5	20.9	22.5	23.3	18.9
Ground bone,	29.17	27.6	47.8	20.0	29.2	25.0	22.2	47.8	31.8
All classes except miscellaneous,	26.5	33.5	38.7	46.0	36.0	30.4	35.0	32.0	28.0

A comparison of the average composition of all samples of complete fertilizers for which guaranties are recorded with the average of the corresponding guaranties, for several seasons past, including those of this season, follows:

Average Composition and Guaranty Compared.

	Average composition. Per cent.	Average guaranty. Per cent.
Spring, 1910.		
Phosphoric acid:		
Total,	9.80	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Fall, 1910.		
Phosphoric acid:		
Total,	9.72	8.80
Available,	8.26	7.62
Potash,	5.20	4.68
Nitrogen,	1.63	1.60
Spring, 1911.		
Phosphoric acid:		
Total,	9.86	8.96
Available,	8.31	7.86
Potash,	4.97	4.65
Nitrogen,	1.53	1.54
Fall, 1911.		
Phosphoric acid:		
Total,	9.59	9.09
Available,	8.20	7.87
Potash,	3.63	3.39
Nitrogen,	1.12	1.19
Spring, 1912.		
Phosphoric acid:		
Total,	9.51	8.82
Available,	8.09	7.78
Potash,	5.34	5.05
Nitrogen,	1.56	1.58

Average Composition and Guaranty Compared—Continued.

	Average composition, per cent.	Per Average guaranty, per cent.
Spring, 1913.		
Phosphoric acid:		
Total,	9.71	8.92
Available,	8.11	7.37
Potash,	5.41	5.17
Nitrogen,	1.61	1.62
Fall, 1913.		
Phosphoric acid:		
Total,	9.86	9.09
Available,	8.06	7.83
Potash,	4.28	4.27
Nitrogen,	1.47	1.35
Spring, 1914.		
Phosphoric acid:		
Total,	9.31	8.71
Available,	8.06	7.83
Potash,	5.67	5.52
Nitrogen,	1.81	1.69
Fall, 1914.		
Phosphoric acid:		
Total,	9.84	9.25
Available,	8.41	8.00
Potash,	3.42	2.99
Nitrogen,	1.29	1.27

It is of interest to note how closely the series of valuations based upon the wholesale price of raw materials in the principal markets during the most important buying season and upon certain average allowances for expenses and profits on the part of the mixer and jobber, coincides with the retail prices later ascertained. A comparison for several seasons past is given below:

Comparison of Selling Price and Valuation, 1910-1914.

	Selling price	Valuation	Excess of valuation over selling price
Complete fertilizers:			
1910, Spring,	25.26	26.63	1.43
Fall,	21.76	22.24	.48
1911, Spring,	24.97	25.95	.98
Fall,	21.73	22.23	.61
1912, Spring,	27.64	27.24	— .40
1913, Spring,	25.08	26.44	1.36
Fall,	21.92	24.36	2.44
1914, Spring,	24.72	26.93	2.21
Fall,	20.83	22.64	1.81
Dissolved bone:			
1910, Spring,	22.17	21.47	— .70
Fall,	25.80	25.70	— .10
1911, Spring,	20.83	23.82	3.49
Fall,	24.88	21.51	— 3.37
1912, Spring,	20.94	18.92	2.82
1913, Spring,	18.55	21.63	3.08
Fall,	24.75	24.26	— .49
1914, Spring,	26.25	27.28	1.03
Fall,	16.05	19.02	2.97

Comparison of Selling Price and Valuation, 1910-1914—Continued.

	Selling price	Valuation	Excess of valuation over selling price
Rock and potash:			
1910, Spring,	17.16	16.08	-1.08
Fall,	16.38	16.34	-.04
1911, Spring,	17.05	15.99	-1.06
Fall,	16.25	16.07	-.18
1912, Spring,	18.17	16.26	-1.91
1913, Spring,	16.75	16.52	-.23
Fall,	16.25	16.85	.60
1914, Spring,	16.79	15.60	-1.19
Fall,	15.21	15.42	.21
Dissolved rock:			
1910, Spring,	14.56	14.00	-.56
Fall,	14.01	14.15	.14
1911, Spring,	15.83	14.56	-1.58
Fall,	14.00	13.78	.22
1912, Spring,	14.69	14.20	-.49
1913, Spring,	13.96	14.25	.29
Fall,	13.51	13.70	.19
1914, Spring,	14.48	13.71	-.77
Fall,	13.78	13.97	.19
Ground bone:			
1910, Spring,	30.19	30.27	.08
Fall,	29.98	31.10	1.12
1911, Spring,	30.93	31.47	.54
Fall,	31.17	31.18	.01
1912, Spring,	32.81	33.26	.45
1913, Spring,	33.86	32.50	-3.36
Fall,	31.12	32.63	1.51
1914, Spring,	31.43	30.15	-1.28
Fall,	32.20	33.45	1.25



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